ANNALS
OF THE
MISSOURI BOTANICAL GARDEN

VOLUME 63 1976 NUMBER 4

THE GENUS *MORAEA* IN THE WINTER RAINFALL REGION OF SOUTHERN AFRICA[1]

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ABSTRACT

The genus *Moraea* (Iridaceae), a close relative of *Iris*, and believed to have evolved independently of *Iris* from *Dietes*, is an exclusively African genus. It ranges from Nigeria and Ethiopia south through the African highlands to the southern tip of Africa where a winter rainfall regime prevails. *Moraea* appears to have radiated explosively in this region where 54 of the 93 species are found, 51 essentially being endemic. The winter rainfall region is also the center of diversity of *Moraea* and the probable area of origin for the genus. The present revision, the first since Baker's (1892) treatment in *Flora Capensis*, includes details of phylogeny, ecology, phytogeography and cytology, with new chromosome reports for five species. The treatment includes descriptions of nine new species and one new combination.

Moraea, one of the larger genera of the Iridaceae, is closely related to the well known *Iris* and can be regarded as an African counterpart of this genus. It belongs with *Iris* in subfamily Iridoideae, and in the tribe Irideae, which includes the Old World representatives of this subfamily. It comprises approximately 92 species which are widely distributed in sub-Saharan Africa. Species occur mainly in the more temperate highland areas and the concentration increases considerably towards the south. In South Africa alone there are 74 species. Of this number, 54 occur in the southern African winter rainfall region which embraces the southern and western part of the Cape Province of South Africa as well as the extreme southern portion of South West Africa (Namibia), where a single species only is found.

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[1] I wish to thank Professor T. T. Barnard, Compton Herbarium, Kirstenbosch, South Africa for sharing his knowledge of *Moraea* gained over many years and particularly for his generous advice with historical data. I also thank my wife, Margaret, for her invaluable assistance in the field, in the drawing of the maps, and in the preparation of the manuscript. Illustrations by Margo Branch are gratefully acknowledged. Support for this study was provided by a grant from the U.S. National Science Foundation (BMS-74-18905) from 1974 to 1976 and from the South African Council for Scientific and Industrial Research in 1971.

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ANN. MISSOURI BOT. GARD. 63: 657–786.

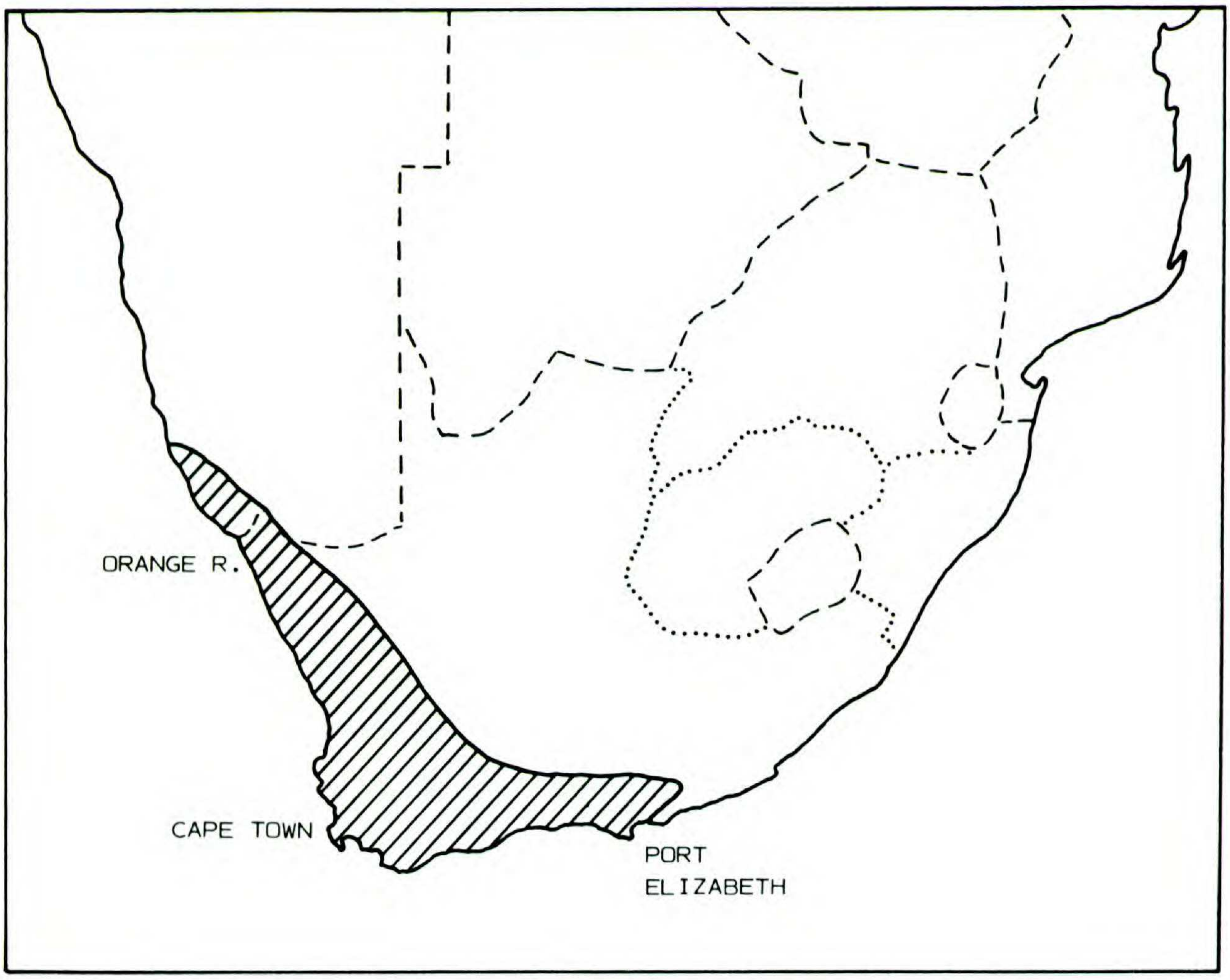

FIGURE 1. Southern Africa with the winter rainfall region shaded.

The genus is currently being revised in three stages. A treatment of the species of the summer rainfall region of southern Africa (South Africa, Botswana, Lesotho, Swaziland, and South West Africa) has been published (Goldblatt, 1973), and the present paper constitutes the second phase embracing the southern African winter rainfall region. A study of the tropical African species, already in progress, will form the final part of the revision. Cytological studies undertaken in conjunction with the taxonomic work has led to a considerably clearer understanding of the evolution and relationships of species within the genus. Cytology has been particularly significant at the subgeneric level where different basic chromosome numbers and varied karyotypes have provided the rationale for a redefinition of subgenera and sections, and has formed the basis for a revised subgeneric classification (Goldblatt, 1976a).

The winter rainfall region as delineated here forms a natural phytogeographic zone and *Moraea* exhibits a high degree of endemism within the area. Of the 54 species found here, two, *M. spathulata* and *M. polystachya*, are summer rainfall region species with minor range extensions into the winter rainfall zone, and as such are not dealt with in detail, while a third, *M. falcifolia* is equally distributed in both rainfall zones. The remaining 51 are essentially endemic in the winter rainfall region with only four species having a limited extension into adjacent parts of the summer rainfall zone.

GEOGRAPHIC LIMITS: THE WINTER RAINFALL ZONE OF SOUTHERN AFRICA

The winter rainfall area of southern Africa, with a climate unlike that of the rest of sub-Saharan Africa, has a very characteristic and rich flora, and a large part of this area is often regarded as one of the six major floristic regions of the world (Good, 1968). It is here, in what is generally known as the Cape Floral Region, that *Moraea* has its present center of development. The greatest range of variation in the genus, as well as the majority of species, is found entirely within this area. The actual geographic limits of the Cape Floral Region are not clearly defined, but usually include the southern Cape coast from Port Elizabeth to Cape Town, extending north to embrace the Cedarberg and Nieuwoudtville area some 300 km to the north. The winter rainfall region as treated here includes not only this area, but the area to the north generally known as Namaqualand, as well as the extreme southwestern tip of South West Africa (Fig. 1). The region thus defined receives predominantly winter rainfall and forms a phytogeographic unit as far as *Moraea* is concerned. The area included in this treatment receives at least 40% and up to 100% of its rainfall in the winter months between May and October (Adamson, 1938). By this definition the area west of a line drawn from Port Elizabeth and Grahamstown in the east, to Laingsburg and then to Luderitz Bay, South West Africa, in the northwest is regarded here as the winter rainfall region of southern Africa (Fig. 1), complementing the summer rainfall region as defined earlier by me (Goldblatt, 1973).

RELATIONSHIPS OF *MORAEA*

ORIGIN AND ANCESTRY

Moraea is a member of subfamily Iridoideae, tribe Irideae, and is related to the Old World representatives of this tribe (Table 1). It is closely allied to the widespread northern hemisphere genus *Iris*, and probably shares with it a common origin in *Dietes*, perhaps the most primitive genus of Irideae, or the immediate ancestors of this genus (Goldblatt, 1976a). The characteristic features of these three genera are the *Iris*-like flower with large spreading outer tepals, small inner tepals, and petaloid style branchs with large paired crests. *Dietes* has a woody, rhizomatous rootstock, evergreen typically Iridaceous equitant leaves, and free tepals and stamens. *Iris*, with either a rhizomatous or bulbous rootstock, is specialized in being predominantly deciduous, and in having tepals united in a tube.

Moraea differs from both in its distinctive cormous rootstock, bifacial leaves, deciduous habit, and though the tepals are free in all but two species, the stamens are usually partly united. As discussed in a previous paper, these modifications are predominantly adaptations to a dry seasonal climate with only a short growing season (Goldblatt, 1976a).

GENERIC LIMITS AND AFFINITIES

Moraea is clearly distinct from the northern hemisphere *Iris* as well as from the less specialized and presumably ancestral *Dietes*, though this genus has often been included in *Moraea*. *Dietes* in fact has more in common with *Iris* and is certainly best regarded as a distinct genus, ancestral to both *Moraea* and *Iris*, as suggested by Salisbury (1812) and Spae (1846) and recently supported by myself (Goldblatt, 1971, 1976a). *Moraea* is less distinct, however, from several small and closely related genera including *Homeria*, *Hexaglottis*, *Gynandriris*, the recently recognized *Barnardiella* (Goldblatt, 1976b), and also *Galaxia* (though this is perhaps more sharply defined than the others). All share with *Moraea* a characteristic corm and corm tunic, a basically bifacial to occasionally terete leaf, deciduous habit, and similar inflorescence structure; because of these similarities, all except *Galaxia* have at one time been included in *Moraea*.

Homeria, with subequal tepals and the style branches and style crests much reduced or with the crests lacking, differs least. It may conceivably even be polyphyletic, including more than one evolutionary line from *Moraea* with reduced style crests. *Hexaglottis* represents a further step in the reduction of the style branches, which in this genus are each deeply forked and filiform.

Gynandriris is perhaps equally closely related to *Moraea*. It has flowers like species such as *M. polyanthos*, but is easily distinguished by the peculiar sterile prolongation of the ovary which forms a tube, raising the flower above the inflorescence spathes. This tube, together with distinctive transparent spathes, make this small genus easy to recognize. *Gynandriris* has in the past frequently been included in *Moraea* as subgenus *Helixyra*. It has also been included in *Iris* which quite wrongly reflects its natural relationships (unless *Moraea* too is included in *Iris*). The decision finally to regard *Gynandriris* as distinct was made by Brown (1929), and except for the inclusion of *G. sisyrinchium* in *Iris* by various European botanists, this decision has generally been followed.

The recently described *Barnardiella* is peculiar in two respects: it has an ovary tube like that found in *Gynandriris*, while its flower is similar to that of *Homeria*, with reduced style branches and crests. Cytological evidence (Goldblatt, 1976b) suggests an independent origin from *Moraea* subgenus *Moraea*.

As already mentioned, *Galaxia* is a more clearly defined genus than the other close relatives of *Moraea*. A flower with a long perianth tube, and a stemless habit, make it distinctive. Its ancestors were probably similar to species such as *Moraea falcifolia* (*Moraea* subgenus *Moraea*) from which it differs mainly in having a perianth tube and reduced style crests.

It is fairly obvious that *Homeria*, *Hexaglottis*, *Gynandriris*, and *Barnardiella* are all very closely related to *Moraea*. However, they appear to the present author to merit generic status, not only because each constitutes a natural group, but also since any enlargement of *Moraea* would make this genus, already comprising five subgenera, unwieldy. In an earlier classification (Goldblatt, 1971) I had included *Moraea* with *Gynandriris*, *Dietes* and *Iris* in Iridinae while regarding *Homeria*, *Hexaglottis*, and *Galaxia* as constituting a separate subtribe, Homeriinae. However, it now seems preferable to include all the cormiferous, bifacial-leafed members of Iridoideae-Irideae in a single alliance (Table 1); the earliest name for such a group being Homeriinae (Goldblatt, 1971). *Dietes*, together with *Iris* and its segregates with either rhizomatous or bulbous rootstocks

TABLE 1. Classification of the African Iridoideae tribe Irideae.

Subtribe 1. *Iridinae*
Iris (s.l.), *Hermodactylis*, *Belamcanda*, *Dietes*.

Subtribe 2. *Homeriinae* Goldbl.
Moraea, *Homeria*, *Hexaglottis*, *Gynandriris*, *Barnardiella*, *Galaxia*.

Subtribe 3. *Ferrariinae* Goldbl.
Ferraria.

then constitute the Iridinae. The only other African member of the Iridoideae-Irideae, *Ferraria*, seems well placed in its own subtribe, Ferrariinae as suggested earlier by me (Table 1).

DELIMITATION OF SUBGENERA AND SECTIONS

In order to assist the reader in understanding the introductory discussion that follows, the subgenera, sections, and species are presented in outline in Table 2. Species of subgenus *Vieusseuxia* and *Grandiflora* occurring outside the winter rainfall region are not listed.

As a result of data now known, the subgeneric classification proposed by Baker (1896) has been considerably modified (Goldblatt, 1976a). Five subgenera are recognized, three of which, *Moraea*, *Visciramosa* and *Monocephalae*, are regarded as having evolved along independent paths from an ancestral stock. Each has retained the postulated basic chromosome number for the genus, $x = 10$, and usually has an unspecialized morphology. The presumably primitive and ancestral features of multiple branching, two to several leaves, and simple flower structure occur in subgenus *Visciramosa* and some species of subgenus *Moraea*. Subgenus *Monocephalae* as well as certain members of subgenus *Moraea* are, however, vegetatively specialized with a single leaf and reduced branching.

The two remaining subgenera, *Vieusseuxia* and *Grandiflora* have a derived base number, $x = 6$, and are variously modified. In subgenus *Vieusseuxia* floral specialization predominates, and all except three or four species are unifoliate. Species of subgenus *Grandiflora* are large, single leafed, invariably unbranched, and, although the flowers themselves are unspecialized, the flat discoid seeds are characteristic. Similar seeds are also found in subgenus *Monocephalae*; the two subgenera are, however, considered to be unrelated.

Subgeneric delimitation has been largely based on cytological data and the resulting divisions clearly comprise natural assemblages. Morphologically, however, there is often little to distinguish the single-leafed, fewer-branched species of subgenus *Moraea* (section *Deserticola*) from the florally unmodified members of subgenus *Vieusseuxia* (section *Polyanthes*), nor the few multi-leafed members of *Vieusseuxia* from those of subgenus *Moraea*. The less robust and small-flowered species of subgenus *Grandiflora* are almost equally difficult to distinguish from subgenus *Vieusseuxia* in the absence of seeds, which of course are seldom collected. For such reasons a key to the subgenera is impractical and is not provided.

Sections are recognized only in subgenera *Moraea* and *Vieusseuxia*, and are

TABLE 2. Subgenera, sections, and species of *Moraea*.

I. Subgenus *Moraea*

Section 1. *Moraea*

1. *M. ramosissima* (L.f.) Druce
2. *M. gawleri* Spreng.
3. *M. vegeta* L.
4. *M. indecora* Goldbl.
5. *M. fergusoniae* L. Bol.
6. *M. papilionacae* (L.f.) Ker
7. *M. margaretae* Goldbl.
8. *M. serpentina* Baker
9. *M. tortilis* Goldbl.
10. *M. lugubris* (Salisb.) Goldbl.

Section 2. *Acaules*

11. *M. falcifolia* Klatt
12. *M. ciliata* (L.f.) Ker
13. *M. macronyx* Lewis
14. *M. tricolor* Andrews

Section 3. *Deserticola*

15. *M. saxicola* Goldbl.
16. *M. macgregorii* Goldbl.
17. *M. namibensis* Goldbl.
18. *M. bolusii* Baker

Section 4. *Subracemosae*

19. *M. gracilenta* Goldbl.
20. *M. fugax* (de la Roche) Jacq.

Section 5. *Tubiflora*

21. *M. cooperi* Baker
22. *M. longiflora* Ker

II. Subgenus *Visciramosa*

23. *M. bituminosa* (L.f.) Ker
24. *M. bubalina* Goldbl.
25. *M. viscaria* (L.f.) Ker
26. *M. inconspicua* Goldbl.
27. *M. elsiae* Goldbl.

III. Subgenus *Monocephalae*

28. *M. angusta* (Thunb.) Ker
29. *M. anomala* Lewis
30. *M. neglecta* Lewis

IV. Subgenus *Vieusseuxia*

Section 6. *Polyanthes*

31. *M. polystachya* (L.f.) Ker
32. *M. polyanthos* Thunb.
33. *M. nubigena* Goldbl.

Section 7. *Vieusseuxia*

34. *M. algoensis* Goldbl.
35. *M. tripetala* (L.f.) Ker
36. *M. debilis* Goldbl.
37. *M. barnardii* L. Bol.
38. *M. incurva* Lewis
39. *M. barkerae* Goldbl.
40. *M. thomasiae* Goldbl.
41. *M. unguiculata* Ker
42. *M. lurida* Ker
43. *M. insolens* Goldbl.
44. *M. tricuspidata* (L.f.) Lewis
45. *M. bellendenii* (Sweet) N.E.Br.
46. *M. neopavonia* Foster
47. *M. gigandra* L. Bol.
48. *M. caeca* Barnard ex Goldbl.
49. *M. aristata* (de la Roche) Asch. & Graeb.
50. *M. amissa* Goldbl.
51. *M. villosa* (Ker) Ker
52. *M. tulbaghensis* L. Bol.
53. *M. loubseri* Goldbl.

V. Subgenus *Grandiflora*

54. *M. spathulata* (L.f.) Klatt

based entirely upon morphological considerations. Differences between sections are sharp, being based on gross features. In subgenus *Moraea*, the entirely subterranean stem distinguishes section *Acaules*; a perianth tube, section *Tubiflora*; a beaked ovary and lack of basal leaf, section *Subracemosae*; and a solitary leaf and dark corm tunics, section *Deserticola*. Floral differences distinguish the two sections of subgenus *Vieusseuxia*, with flowers of the specialized section *Vieusseuxia* differing from those of section *Polyanthes* in their modified and reduced inner tepals. Unlike the divisions between the subgenera, these sectional differences are not reflected in the cytology, and their karyotypes do not differ markedly. Morphological similarities between the sections make their relationships fairly clear and sectional affinities are discussed in the taxonomic treatment.

CYTOLOGY

Chromosomal characteristics have proved of considerable value in the understanding of evolution and phylogeny in *Moraea*, providing the basis for the recent subgeneric classification (Goldblatt, 1976a). With the counts for five newly described species reported here for the first time,[3] chromosome number is known for 55 species, almost 60% of the genus. The pattern which has emerged has been fully described elsewhere and is only briefly summarized below. Documentation of chromosome numbers listed for each species has been presented in an earlier paper (Goldblatt, 1976a) and is not repeated here.

The base number for the genus is probably $x = 10$, the same as that in *Dietes*. In the three subgenera regarded as primitive, *Moraea*, *Visciramosa*, and *Monocephalae*, $x = 10$ is clearly basic, though gametic numbers of $n = 9, 8, 6$ also occur in the large subgenus *Moraea*. The two specialized and independently derived subgenera, *Vieusseuxia* and *Grandiflora*, have a base number of $x = 6$, and only multiples based on $x = 6$ occur in these subgenera.

The chromosomes of *Moraea* are large, and a variety of karyotypes has provided many indications of the relationships of species and sections. As karyotypic details have already been fully described, they are only mentioned in the taxonomic treatment when particularly relevant to the generic and sectional relationships or when significant in understanding the status or evolution of certain species.

GEOGRAPHY

For the purpose of this discussion, the winter rainfall area has been divided into three clearly defined divisions found to be significant in the distribution of *Moraea* (Fig. 2). The detailed phytogeographic units described by Weimarck (1941) for the Cape Floral Region are not considered, as *Moraea*, with its range extending well to the north of the area treated by Weimarck, is by no means a typical member of the Cape Flora.

A total of 54 species of *Moraea* occur in the winter rainfall region, and the majority, 47 species, are endemic. Of the seven species which extend beyond the limits of the region (Fig. 1) two, *Moraea spathulata* and *M. polystachya*, may be considered summer rainfall region species with minor extensions of their range

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[3] Chromosome counts for the following species are reported here for the first time: *Moraea indecora*, *M. tortilis*, *M. saxicola*, *M. macgregorii*, and *M. barkerae*. Voucher information for these counts is given following the species descriptions.

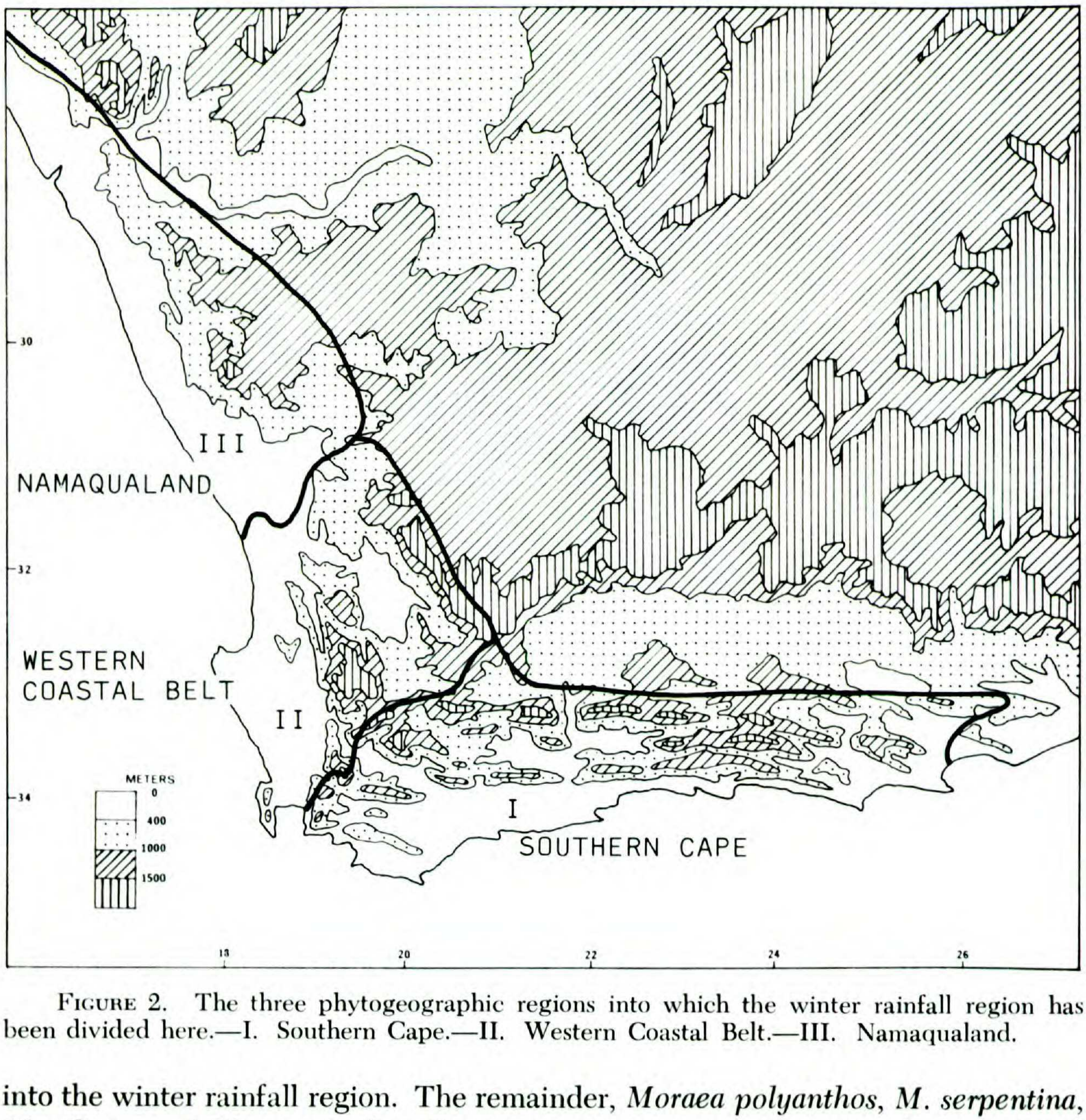

FIGURE 2. The three phytogeographic regions into which the winter rainfall region has been divided here.—I. Southern Cape.—II. Western Coastal Belt.—III. Namaqualand.

into the winter rainfall region. The remainder, *Moraea polyanthos*, *M. serpentina*, *M. ciliata*, and *M. unguiculata*, have very minor range extensions into the summer rainfall zone, while *M. falcifolia* is equally distributed over both summer and winter rainfall portions of the Cape Province. The majority of species of *Moraea* occur in only one or two of the three phytogeographic divisions of the winter rainfall region recognized here, and only five species occur over almost the entire area, these being *M. gawleri*, *M. fugax*, *M. inconspicua*, *M. unguiculata*, and *M. ciliata*, the last two also extending into the summer rainfall region. Following are the three phytogeographic divisions:

I. The Southern Cape, including the Little Karoo and Long Kloof: This area extends from Grahamstown and Port Elizabeth in the east to the Hottentots Holland Mountains in the west. Almost all of this region may receive at least limited, though significant, summer precipitation. (30 species, 8 endemic.)

II. The Western Coastal Belt: This area extends from the Cape Peninsula north to Nieuwoudtville and the mountains of the Van Rhynsdorp district, and reaches inland to include the Warm and Cold Bokkeveld. Except in the extreme south, this region receives almost entirely winter rain. (34 species, 11 endemic.)

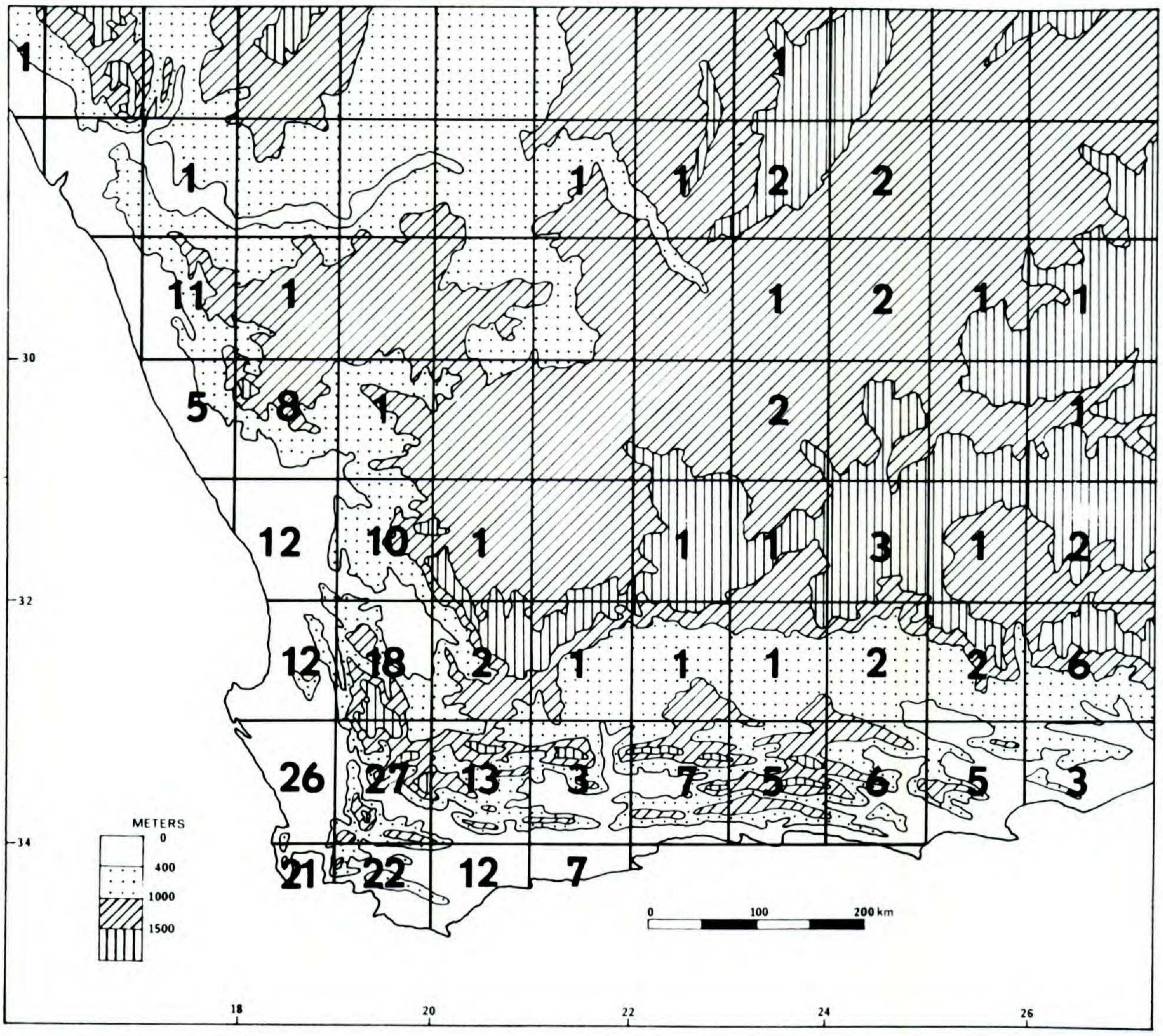

FIGURE 3. Concentration of species of *Moraea* in the southern African winter rainfall region and adjacent areas. Figures indicate the number of species in each geographical degree square.

III. Namaqualand: This area includes the arid northwestern Cape, from the Van Rhynsdorp district northwards, and it extends as far as southern South West Africa. The region is extremely arid, receiving less than 25 cm of annual precipitation, mainly in the winter months. (16 species, 8 endemic.)

If the geographical distribution of *Moraea* in the winter rainfall region is considered in the light of a superimposed grid, the lines of which for convenience are taken as whole number geographical coordinates, the following pattern emerges. The greatest number of species of *Moraea* are found in the extreme southwestern part of the region, and the concentration decreases to the east and to the north (Fig. 3), a pattern typical of species occurring in the Cape Flora (Dahlgren, 1963). There are 26 species in the Cape Town grid (33.18)[4] and 27 in the Worcester grid (33.19) with 3 endemic in the first and 2 in the second. The next highest number of species occurs in the Caledon grid (34.19) where there are 22 species and 3 endemics.

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[4] Plant distributions in southern Africa are often expressed in terms of geographical degree squares rather than by administerial districts. Each square or grid is defined by a degree of latitude and longitude and is expressed in numerical terms as well as by the name of a major town within it (Edwards & Leistner, 1971).

A noteworthy secondary center of species concentration is the Springbok area of Namaqualand (29.17), where 11 species occur, only 1 of which is endemic. This small area is at a fairly high altitude, where cooler temperatures make the prevailing low precipitation particularly effective. In addition, a greater variety of soil types than found elsewhere in Namaqualand provides a correspondingly wider range of available habitats (see discussion under *Moraea saxicola*). The Springbok area is the center of the small section *Deserticola* with two of the four species in the alliance found here.

This secondary Namaqualand center of speciation is known for several genera that are concentrated in the Cape Flora but tolerate the drier situations that surround the region, e.g., *Lapeirousia* (Goldblatt, 1972a) and *Euryops* (Nordenstam, 1969).

With the exception of subgenus *Grandiflora*, only one species of which occurs partly in the winter rainfall region, the four remaining subgenera of *Moraea* are all centered here where subgenera *Moraea*, *Visciramosa* and *Monocephalae* are endemic. These four subgenera and all sections except section *Deserticola* and section *Polyanthes* have their center of distribution in the extreme southwestern Cape. Section *Deserticola* is centered in the Namaqualand region, while section *Polyanthes* has its center in the highlands of southeastern Africa. With the greatest number of species, and with the least specialized subgenera concentrated in the winter rainfall region, it is difficult not to envisage the southwestern Cape as the place of origin of *Moraea*. The fact that the winter rainfall climate is probably a very recent phenomenon, perhaps of the last two million years (Raven, 1973; Axelrod, 1973) tempers this conclusion since the genus must be of considerably greater age. However, *Moraea* probably did evolve in, or somewhat north of, this region, although under a rather different climatic regime, characterized by low, but not winter, rainfall and considerable seasonal aridity (Goldblatt, 1976a).

ECOLOGY

HABITAT

There are three main soil types in the Cape winter rainfall region: clay soils derived from shale; a very characteristic white sandy soil derived from sandstones of the Cape System; and a granite-derived, coarse gritty soil, very common in Namaqualand, and local elsewhere. In areas of high rainfall in the south, the granitic soils tend to become clayey, but in the dry areas to the north, they are well drained and coarse grained. Soil differences are enhanced by the fact that in the rugged topography of the southwestern Cape the mountains are primarily composed of resistant sandstone and the valleys and plains of shales; thus lowland species are mainly found in clay soils and montane species in sandy or stony ground. In fact the range of many species is closely related to soil type and the southwestern Cape species can generally be classed as lowland and clay, or montane and sand-loving species (Dahlgren, 1968).

In the areas of highest rainfall in the extreme south and west, however, soil type seems less important, and the correlation between species and soil type often breaks down, a pattern in keeping with observations (Raven, 1964) that soil conditions are increasingly critical to plant species in drier climates as rocks weather more slowly so that their chemical constitution becomes more significant. Thus *M. gawleri*, a clay-loving species of slopes and flats in dry areas, may be found on sandy soils in the south, and similarly, *M. unguiculata*, always found on clay in arid areas also occurs on sand in the mountains of the south. In contrast, *M. ciliata*, typically though not invariably sand-loving in drier areas, often occurs on a clay substrate in the Cape and Caledon districts. *Moraea tripetala* is particularly exceptional in that it is found both on sand or clay with equal frequency and appears to comprise several local races each with different ranges and habitats. Most species, however, are readily characterized by a particular soil preference.

Most species of *Moraea* grow in open fynbos, the name given to the small-leafed vegetation of the southwestern Cape, and are not found on wetter slopes and gullies which are often heavily wooded. *Moraea ramosissima* and *M. nubigena* are the only notable exceptions in having an affinity for moist habitats. *Moraea ramosissima* occurs along streams, seepage areas, or forest margins, the latter a situation where *M. spathulata* is also often found. *Moraea nubigena* occupies a unique niche in the genus, growing in moss banks on rock flushes at high altitude. Clay loving species of *Moraea* usually occur in Renosterbos veld (Acocks, 1953), which is a low-growing, fine-leafed scrub, dominated by *Elytropappus rhinocerotis* (L.f.) Less. and other bushy Compositae, and which is particularly rich in geophytic plants of several families. Species growing in the sandy Cape soils share their habitat with more typical fynbos, dominated by sclerophyllous Proteaceae and microphyllous Ericaceae and Rutaceae, and with a ground cover of the characteristic Restionaceae. In many areas the geophytes tend to become crowded out by larger, taller species and may not flower for many years, until the area is cleared artificially or by frequent fires. Some species, such as *M. tricuspidata*, *M. lurida*, and *M. insolens*, are particularly fire responsive and often flower only in the seasons immediately following a burn.

Such habitats as described seldom apply in Namaqualand, where fynbos is barely developed. Species of *Moraea* in this area generally occur in stony places where the corms are sheltered from predators and where additional moisture is available.

FLORAL BIOLOGY

The flowers of many species of *Moraea* are relatively short lived, opening at constant times during the morning or afternoon and lasting until late the same day. In some species they are particularly fugaceous, as in subgenus *Visciramosa* where flowers usually open after midday, about 1:00 P.M. and fade by evening, and one species in the subgenus, *M. viscaria*, opens only after 3:00 P.M.

Short-lived flowers also occur in section *Subracemosae* and section *Deserticola* where blooming takes place during the afternoon. *Moraea macgregorii* and the Cedarberg populations of *M. anomala* (subgenus *Monocephalae*) are especially notable, opening only after 4:00 P.M. and fading shortly after nightfall.

Flowers in section *Vieusseuxia* are generally longer lasting, and in the large-flowered "peacock moraeas," i.e., *Moraea villosa* and its close allies, flowers survive up to three days.

Virtually nothing is known of pollination biology in *Moraea* apart from observations by Scott-Elliot (1891). Many species are heavily and sweetly scented, usually the less brightly colored or marked ones; scent in these is probably an added attractant to the visual stimulus. My experiments on a few species have indicated self-incompatibility: thus species must rely on insect visitors to accomplish pollination. Bees have been observed visiting flowers and are undoubtedly the most important pollinators. The bee normally orients itself by the nectar guide to probe between the outer tepal, claw, and style branch in search of nectar. In doing so it brushes against the receptive upper surface of the stigma, and then only does it come in contact with the anther. Other noted visitors are small day-flying moths and brown skipper butterflies, as well as herbivorous beetles which frequently devour whole flowers when in sufficient number.

Given the great degree of floral specialization in many species of *Moraea*, it is highly likely that there are significant differences in pollination, and, undoubtedly, there is stringent selection for certain flower characteristics and times of opening. Pollination biology in *Moraea* has been little studied and remains full of unanswered questions awaiting future study.

CONSERVATION

While most species of *Moraea* are relatively widespread within the Cape region, the genus comprises a number of very localized species. A total of 17 of the 54 species in the area treated occur within a one degree square grid. Some of these local species are known from single gatherings or from one or two populations only and can be regarded as potentially endangered species, while others have in the last 50 years been severely affected by the activities of man and his impact on the environment and are in imminent danger of extinction or even already extinct.

Possibly extinct are *Moraea incurva*, known from one gathering at the foot of the mountains between Wellington and Tulbagh, an area now under intensive cultivation, and *M. amissa*, also collected only once. A search near the type locality, north of Malmesbury, now partly a wheat field, was unsuccessful in 1974, and this species may be considered lost. The very beautiful *M. aristata*, very well represented in European herbaria and fortunately still in cultivation under the name *M. glaucopis*, is reduced in the wild to a tiny population at the Royal Observatory at Cape Town. Numbers are so low that few if any of the handful of plants at the site flower simultaneously so that reproduction rarely occurs.

Moraea insolens from Drayton siding near Caledon is also reduced to very few individuals, and the main population was recently ploughed under when the area was planted to wheat. Individuals have been observed on the periphery of this field, but numbers are difficult to determine as this shy-flowering species blooms well only after fire (Goldblatt, 1972b). The last species imminently in danger, at least in the wild, is *M. loubseri*, known from only a single granite hill, Olifantskop, near Langebaan on Saldanha Bay. This species was only discovered recently when the hill was turned into a quarry (Goldblatt, 1976c). Efforts to introduce it to other nearby hills, and to cultivation are being made while a part of Olifantskop may be made a reserve.

A number of other species have recently been much reduced in range owing to the spread of agriculture, mainly wheat farming, on the rolling clay lowlands east and north of Cape Town, and species adapted to this habitat are becoming seriously threatened. Two species endemic to the Swartland, north of Cape Town, *Moraea neopavonia* and *M. gigandra*, both large-flowered so-called peacock moraeas fall in this category. Both were once much more common and are now reduced to a few scattered populations among the wheatlands. *Moraea debilis*, found only in the Caledon district west of Cape Town, grows in similar conditions, and the spread of agriculture here too has adversely affected this species, which almost certainly was more common in the past. Further agricultural activity will no doubt result in the extinction of these three species. Other extremely local species include *Moraea indecora*, *M. macgregorii*, *M. barnardii*, *M. tulbaghensis*, *M. nubigena*, *M. longiflora*, and *M. barkerae*. There is, however, no evidence that these were ever much more widespread than they are now, nor do they appear to be threatened at present as they grow in areas unsuitable for agriculture and away from major population centers.

Thus of a total of 54 species of *Moraea* in the southern African winter rainfall region, 2 are probably extinct, 3 more are in immediate danger, at least in the wild, although 2 of these are in cultivation, while a further 3 species can be regarded as severely reduced in range and endangered. The southwestern Cape is well known for its many very local endemics, and this small part of the world probably harbors more rare and seriously endangered species than anywhere else. Solutions to this disturbing situation are not simple as the spread of agriculture in this region is inevitable as the human population continues to expand. In the southwestern Cape an added consideration is the threat to native flora posed by weedy exotics, especially the Australian *Hakea*, *Acacia*, and *Leptospermum*, and the European *Pinus pinaster*, which have spread uncontrollably covering thousands of square kilometers and entirely choking out the native flora in many places. In this light it is difficult to see viable ways to save threatened taxa or to prevent further erosion of populations.

The introduction of species of geophytes such as Iridaceae to botanic gardens is unlikely to be a long-term solution except perhaps for the most striking species. Natural disease, predation, and neglect will almost certainly eventually eliminate species from gardens unless considerably more attention than is currently possible is devoted to the care of such plants. The establishment of many carefully managed small nature reserves throughout the southwestern Cape may prove more workable and seems in my opinion more likely to succeed.

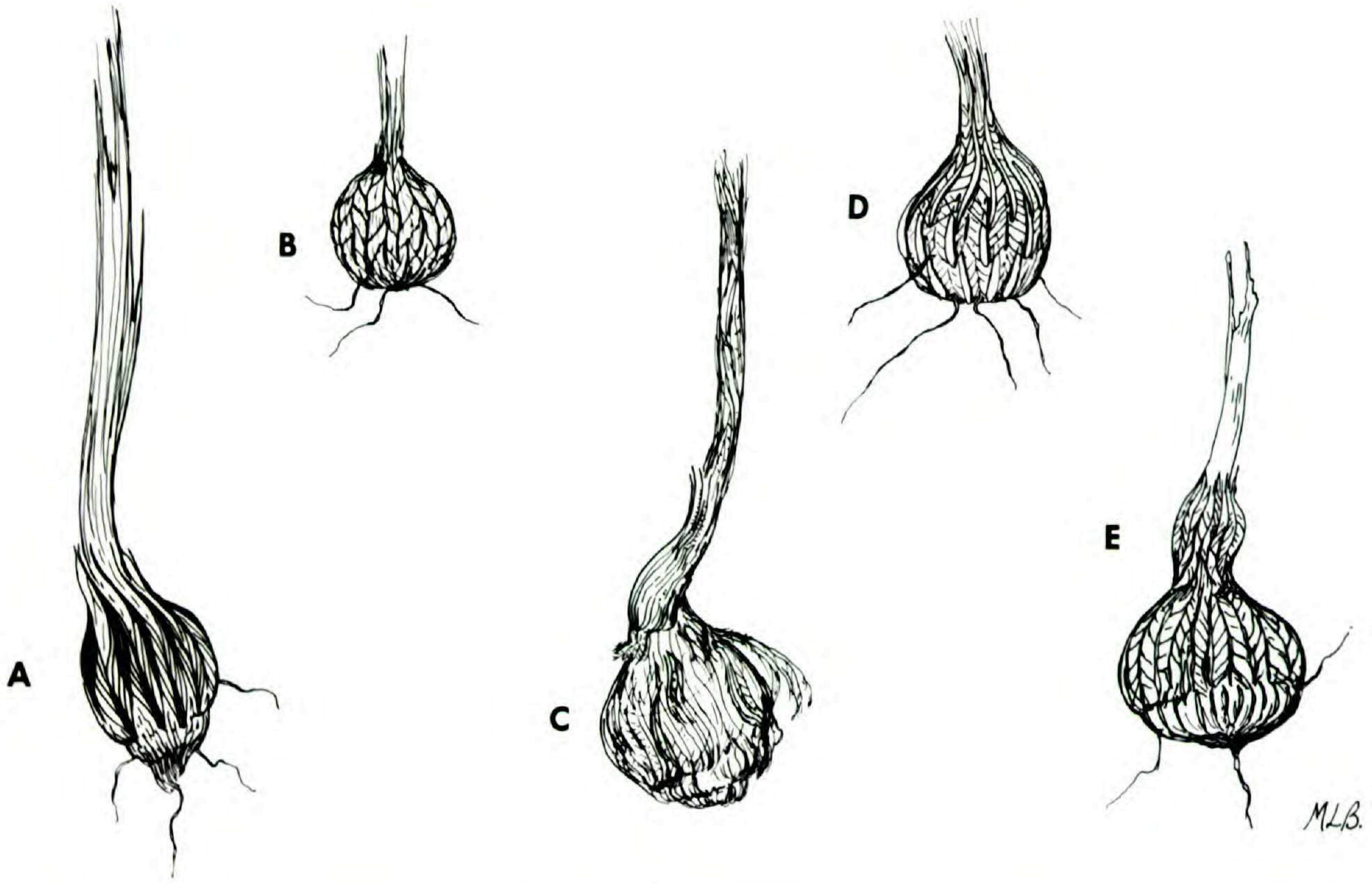

Figure 4. Corm types in *Moraea*.—A. *M. margaretae*.—B. *M. barkerae*.—C. *M. saxicola*. —D. *M. lurida*.—E. *M. fugax*. (× 1.5).

Morphological Characters

ROOTSTOCK

In all species of *Moraea* the rootstock is a true corm (Fig. 4). This modified stem enables the plant to survive during the dormant period and is reproduced annually, developing from a lateral bud near the base of the flowering axis. It consists of a single swollen internode and, usually, a single apical bud. Unlike the corm found in subfamily Ixioideae, the roots are not produced from the corm base, but from the apical bud as this elongates when new growth begins. Apart from size differences there is little to distinguish the corm of each species.

The corm coverings or tunics (Fig. 4) are very variable, often being so distinctive as to permit specific identification. The corm tunic is of foliar origin and is the homologue of the leaf subtending the bud-derived corm. Unlike the corm, the tunics may be long lived, being fairly resistant to decay, and often accumulate round the base of the plant making the corm appear very large. Though very distinctive, most corm tunics are difficult to describe and there is no recognized terminology for the many forms that exist. Description is therefore limited to color, which ranges from black to pale; texture which may be entire and woody to membranous or heavily veined, fissured, or partly to entirely fibrous, either described as fine, medium, or coarse on an arbitrary scale.

Worthy of particular comment are the corms of several groups. The characteristic brown, ± entire, ridged, and fissured tunics in subgenus *Visciramosa* are peculiar in having a curious sticky substance covering their inner surfaces. The tunics of subgenus *Monocephalae* are also immediately recognizable, being of a soft, almost membranous texture, dark brown, and lacerated vertically at the top and base. Coarse black fibrous tunics are uncommon but characteristic of *M. serpentina*, *M. tortilis*, *M. bolusii* and its allies, *M. polystachya*, and *M. polyanthos* (and incidentally of almost the entire genus *Homeria*).

Peculiar corms are found in *M. ramosissima* where the entire corm and numerous cormlets are surrounded by a rigid spiny network of roots. Unusual also is the corm of *M. macronyx*, distinctive in section *Acaules* in its entire tunics, composed of a spongy pithlike material.

LEAVES

Of the various foliar organs produced in *Moraea*, only the major assimilatory structures with a lamina produced above the sheathing base are referred to as leaves. The entirely sheathing basal and usually underground foliar members are called prophylls, while the sheathing cauline ones are called bract leaves or simply bracts. The paired extra-floral, inflorescence valves, here called spathes, are discussed under the inflorescence.

Prophylls.—Sheathing the underground part of the stem, the prophylls are usually membranous and transparent, or with greenish apices. Specialized prophylls occur mainly in subgenus *Grandiflora* and here they may be variously enlarged and thickened, entire or fibrous to cancellate (Goldblatt, 1973). The prophylls in most other species are undistinguished.

Leaves.—The leaf in *Moraea* and its close allies is unusual in the Iridaceae in that the typical equitant lamina is not formed, or is represented only by the very distinctive monofacial leaf apex. Instead, the sheathing base is produced upwards without a break to form a long bifacial, usually linear and channelled, blade (Arber, 1921; Lewis, 1954; Goldblatt, 1971). In a few species, e.g., *Moraea stricta*, *M. tortilis*, juvenile forms of *M. saxicola*, and subgenus *Monocephalae*, the blade is quite terete, but often still with the characteristic apical portion.

The leaves vary in number, the presence of several being regarded as primitive, and the solitary condition found in section *Deserticola*, subgenera *Monocephalae*, *Grandiflora*, and most species of *Vieusseuxia*, specialized. Leaf morphology is a useful taxonomic feature, with pubescence characteristic of certain species and usually reliable, though *M. papilionacea*, *M. tripetala*, *M. villosa*, and *M. caeca* have glabrous or villous leaves. Margins are usually straight, but typically undulate to crisped in *M. bolusii*, *M. serpentina*, *M. fergusoniae*, and most forms of *M. gawleri*. The whole leaf is markedly twisted to coiled in *M. serpentina* and helicoid in *M. tortilis*.

The leaf or lowermost leaves are usually inserted basally, near ground level, but several species have a peculiarly long basal internode so that the lowermost leaf is set well above ground level by flowering time. This gives *M. indecora* and the species of section *Subracemosae*, *M. fugax* and *M. gracilenta*, a very striking appearance. Several species of section *Polyanthes* from the summer rainfall area, e.g., *M. inclinata* and *M. natalensis*, also possess this feature.

Bract leaves.—These are produced at each aerial node and are generally entirely sheathing, with an acute to attenuate apex. The bracts of subgenus *Monocephalae*, and of all species of subgenus *Visciramosa* except *M. bubalina*, are characteristically obtuse to truncate. Bracts are usually herbaceous, but apically tend to become dry and membranous with age, and the apex is often dark brown. The bracts are generally pubescent when this character occurs in the produced leaf.

STEMS

The stem or flowering scape is produced seasonally from the corm and in subgenera *Moraea* and *Visciramosa* is almost always branched. Free branching, as in *Moraea ramosissima* and *M. bituminosa*, is regarded as a primitive state, more so when the stem bears produced leaves. Branching is reduced in some species of subgenus *Moraea*, notably *M. ciliata* and its allies where the stem does not extend above ground. *Moraea falcifolia* and *M. longiflora* also have an underground stem, but both have several branches produced at ground level. Limited branching is also characteristic of many species of subgenus *Vieusseuxia*, though relatively few species regularly have a simple stem, a condition regarded as advanced. All species of subgenera *Grandiflora* and *Monocephalae* are almost always unbranched.

The stem is usually smooth and terete, but notably pubescent in *Moraea vegeta* and villous in *M. papilionacea*, *M. villosa*, *M. tulbaghensis*, *M. neopavonia*, *M. gigandra*, *M. loubseri*, and *M. debilis*.

INFLORESCENCES

The so-called binate rhipidium or corymbose cyme of the Iridaceae (excluding subfamily Ixioideae) varies little in *Moraea*. The two opposed bracts, here termed spathes, enclose several flowers, the number of which is variable. *Moraea cooperi* is unusual in this respect, having a solitary flower in each spathe. The inner spathe is always longer, sometimes considerably so, as in *M. ramosissima*. The spathes are usually herbaceous with a dry acute apex. In subgenus *Monocephalae* and often in subgenus *Visciramosa*, however, they are usually more or less obtuse. In all but the most primitive species, the spathe apex is attenuate and often dark brown. Species found in dry regions often have quite dry spathes by the time flowering takes place, and these may even become torn and lacerated, a condition often seen in *M. polystachya*, *M. serpentina*, and *M. bolusii*, amongst others.

Moraea ciliata and its close relative, *M. tricolor*, as well as *M. macronyx*, are unusual in the genus in that the true leaves and spathes are not distinct and only a single spathe can be recognized. These species are extremely reduced and highly specialized, and the loss of distinction between bracts and leaves is seen as derived.

While spathes are usually glabrous, a few characteristically villous species have a light pubescence on the spathes, particularly *M. papilionacea* and some forms of *M. ciliata*.

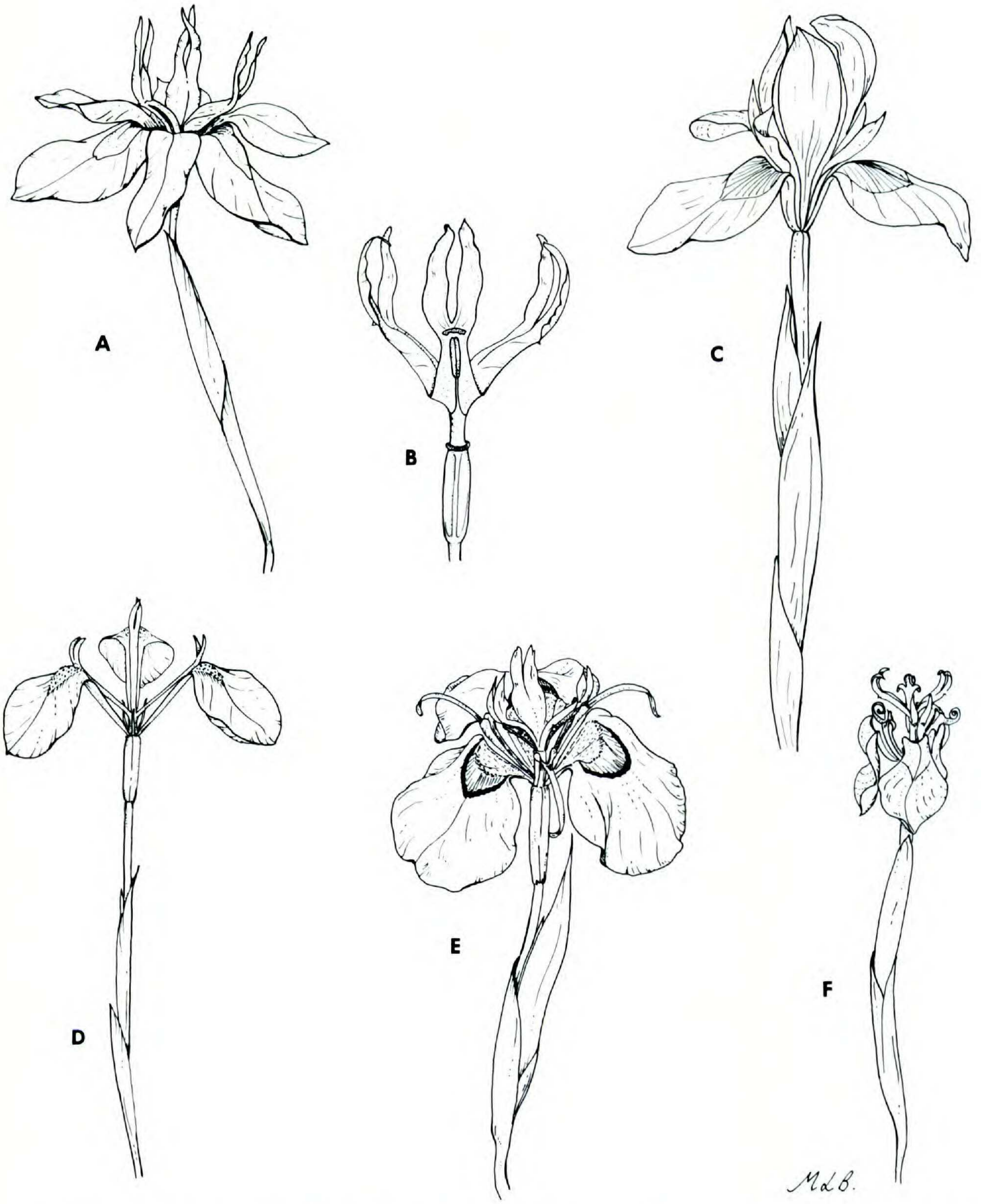

FIGURE 5. Flower morphology in *Moraea*.—A. Typically unspecialized flower of *M. polyanthos*.—B. Androecium and gynoecium.—C. Flower with erect inner tepals, *M. spathulata* (subgen. *Grandiflora*).—D. Inner tepals reduced, *M. tripetala* (subgen. *Vieusseuxia*).—E. Triscuspidate inner tepals and prominent nectar guides, *M. villosa*.—F. Triscuspidate inner tepals and reflexed outer tepals, *M. unguiculata*.

FLOWERS

The basic flower structure in *Moraea* (Fig. 5) consists of six tepals in two whorls, the outer tepals being larger and the inner somewhat to considerably smaller. The tepals are free to the base in all but two species, *M. cooperi* and

M. longiflora, where a true floral tube is developed, apparently an isolated specialization. The outer tepals are generally lanceolate in shape and consist of an erect claw and a broadened limb which is outspread to reflexed at ± 45°. A nectar guide is located at the base of the limb, frequently yellow outlined in a dark color. The claw is usually channelled and heavily pubescent and often nectiferous, with a small nectary located at its base. The inner tepals are generally narrower than the outer and not distinctly clawed, though often flexed at the midline and spread to the same degree as the outer tepals.

This floral pattern is maintained with great fidelity, particularly in the three primitive subgenera, but also in subgenus *Grandiflora* and some species in subgenus *Vieusseuxia*, and without knowledge of color, isolated flowers are of little value in determining species. Notable variations on the basic theme are in the flexure of the tepals, which in some species are very sharply reflexed from 30° to 45°, as in *M. polystachya*, *M. polyanthos*, *M. ramosissima*, *M. nubigena*, and others, while *M. inconspicua* and some forms of *M. unguiculata* (Fig. 5) have completely reflexed outer tepals. A few species have erect inner tepals, sometimes a constant feature as in *M. serpentina* or only in certain forms, as in *M. fugax*. Almost all species of subgenus *Grandiflora* have erect inner tepals.

The shape of the outer tepals is similar in the majority of species but notable exceptions occur in subgenus *Vieusseuxia*, section *Vieusseuxia* (Fig. 5E) where several species have a broad limb, often wider than long. In the group of species known as "peacock moraeas," e.g., *M. villosa* and *M. aristata*, the very broad outer tepals have a conspicuous nectar guide consisting of a yellow center ringed concentrically with broad bands of darkly contrasting color.

The inner tepals show a strong tendency towards reduction in several lines: the first indication of this is the development of a trilobed apex with a long central cusp and shorter lateral lobes. This trend is climaxed by the reduction of the inner tepal to a short cusp or by its complete absence. In subgenus *Moraea*, *M. fergusoniae* has only some populations with tricuspidate inner tepals, while in *M. cooperi* all trace of these is lacking. The majority of species in section *Vieusseuxia* have tricuspidate inner tepals, though notably not *M. thomasiae*, *M. incurva*, and forms of *M. neopavonia*, *M. barkerae*, and *M. amissa*, where the tepal may be entire. While most forms of *M. tripetala* have the tepal reduced to a short cusp, it is absent in certain populations, as well as in the allied species, *M. barnardii* (Fig. 5D).

ANDROECIUM

The three filaments are usually united for about half their length, and the free upper portion of each, as well as the anther, lie pressed against a style branch. The apex of the usually oblong anthers typically reaches to just below the single to bilobed stigma. There is some variation to the degree to which the filaments are united within species, as well as between species, but several groups are notable. In most species of section *Vieusseuxia* the filaments are relatively short but free only near the apex, for ± 1 mm. Exceptions are *M. tripetala*, *M. thomasiae*, and *M. barnardii* where the filaments are barely joined at the base.

In subgenus *Moraea*, a few populations of *M. gawleri* have free stamens and this is also the case occasionally in *M. inconspicua* (subgenus *Visciramosa*). *Moraea angusta* and *M. neglecta* also characteristically have filaments which are connate only at the base.

The anthers are similar in most species, differing only in size. Certain species, *M. gigandra*, *M. insolens*, *M. tulbaghensis*, and *M. neopavonia*, have unusually large anthers which exceed the stigma and usually also the style crests, a condition here referred to as gigandry. The reason for this adaptation is not clear but may ensure self-fertilization if cross-pollination fails to take place.

The pollen is usually yellow in *Moraea*, but certain species such as *M. tripetala*, *M. lugubris* and *M. angusta* have red pollen.

GYNOECIUM

The ovary itself is of little taxonomic value in species of the winter rainfall region and is usually ± oblong and terete. The species of subgenus *Monocephalae* and several species of subgenus *Grandiflora* have a somewhat larger ovary which is distinctly triangular to 3-winged. Above the ovary a filiform style extends the length of the filament column, and perianth tube in the case of section *Tubiflora*. The style divides at the point where the filaments diverge into three flattened branches topped by transverse, often bilobed stigmas. Each style branch bears petaloid crests which are paired, except in *M. lugubris*, where they are irregularly plumose (Fig. 14). The style crests are usually fairly large but in gigandrous species, the crests tend to be very short, sometimes less than a millimeter long and only as large as the stigmas themselves (Fig. 33).

FRUIT

The fruit is always a loculicidal capsule in *Moraea*, in shape usually narrowly clavate with a truncate apex. In the peacock species the ovary elongates considerably as it ripens, and the resulting capsule is slender and cylindrical. The capsule of *M. fugax* and *M. gracilenta* (section *Subracemosae*) is notable in being strongly beaked. A slight beak is also developed in *M. macgregorii* of section *Deserticola*. Capsules are firm walled and erect, except in *M. vegeta* and *M. indecora* where the capsule is flexed to semipendant and softer walls show the impression of the seeds.

Capsules are exserted from the spathes and are borne at their apex, except in section *Tubiflora*, where they are situated near the base of the spathes, and in section *Acaules*, where contractile pedicels draw the ovary into the spathes when the soft-walled capsule ripens.

SEEDS

There are usually many, dark brown, rounded to somewhat angular seeds in each capsule. Unusual flattened, triangular, or discoid seeds are produced in subgenus *Monocephalae* and subgenus *Grandiflora*. Seeds of the peacock species (*M. villosa* and its allies) too are unusual, tending to be large, very angular, and with a spongy, inflated testa. Seeds of many species are unknown but their morphology may be assumed from that of their close relatives.

HISTORY OF *MORAEA*

1758–1778: THE LINNAEAN PERIOD

1758.—The history of *Moraea* begins in 1758 with Philip Miller's publication of the genus *MOREA*, in which he included three taxa described polynomially (*Figs. Pl.*, *Tab. 238, figs. 1–2*, and *Tab. 239, fig. 1*). The first two of these are conspecific and represent the type species of the genus, *M. vegeta* L.; the third is now regarded as belonging to the genus *Dietes*. Prior to this time *Moraea* was known only through various unpublished illustrated works, the most notable of which is the *Codex Witsenii*, a collection of approximately 1,500 paintings of South African plants, amongst them several species of *Moraea*. Similar volumes possibly containing the originals of the paintings in the *Codex Witsenii* are known to be located in various libraries in Europe and South Africa (Barnard, 1947; Jessop, 1966; Macnae & Davidson, 1969). The original paintings were made during the late seventeenth century at the Cape, under the patronage of the Governor, Simon van der Stel and perhaps also of his son Willem Adrian, who was also Governor for some time. They were copied repeatedly, and a few were published in the early eighteenth century (Breyne, 1739; Burman, 1738–1739). However, none of the several paintings of species of *Moraea* was published and no species were described, even polynomially. Thus relatively few people were aware of the existence of the genus prior to 1758.

1762.—Miller's new genus was immediately adopted by Linnaeus in the second edition of *Species Plantarum* (1762), though for some reason he altered the spelling to *MORAEA* (this form now conserved against *Morea*). In this work two species, *M. vegeta* and *M. juncea*, are described with reference to Miller, though without citation of page or plate.

1766.—The publication of Daniel de la Roche's doctoral dissertation, *Plantae Novarum . . .* in 1766 is an important milestone in the history of *Moraea*. De la Roche, a student of David van Royen, the eminent eighteenth century Dutch botanist, described 21 new species of South African Iridaceae, including the new genus *Vieusseuxia* (= *Moraea* subgenus *Vieusseuxia*) with three species, all of which were in cultivation in Holland. Although aware of Linnaeus' *Moraea*, he considered his species allied but generically distinct; the three species described, *M. fugax*, *M. aristata*, and *M. bellendenii* are all somewhat different from the type species of the genus, *M. vegeta*, being slender, solitary leafed, and in the two latter species, in having tricuspidate inner tepals.

De la Roche's first species, *Vieusseuxia spiralis*, illustrated beautifully in the text, is *Moraea bellendenii* (Sweet) N.E. Brown; the earlier epithet could not be transferred to *Moraea* because the name had already been used in this genus (Linnaeus fil., 1781) for a species of *Aristea*; the second is the common Cape species *M. fugax*, long known as *M. edulis* (Goldblatt & Barnard, 1970); and the third is the very rare *M. aristata*, better known in Europe as *M. glaucopis*. Owing to a printing error, the epithets of the second and third species of *Vieusseuxia* were transposed and this led to confusion over their interpretation. Several authors automatically corrected the obvious error, e.g., Jacquin (1776), Houttuyn (1780); others did not realize the mistake, while Lewis (1948) rejected both species on the grounds of confusion. The *Botanical Code of Nomenclature* allows for automatic correction of a printing error of this type and intended application of these de la Roche epithets was therefore revived by Goldblatt & Barnard (1970) (see also discussion under *M. aristata*, p. 773).

While I was studying the specimens associated with de la Roche's species in the Rijksherbarium, Leiden, several manuscripts containing draft descriptions of the published species came to light. The descriptions of *Vieusseuxia aristata*, progressively refined, clearly with considerable help from van Royen, reveal quite surprisingly that de la Roche began by describing the white form of *Moraea gigandra*. Van Royen obviously had a similar plant in cultivation and assumed it was de la Roche's subject, so that by the time the description was published, it was so modified as to apply to what we must now call *M. aristata*, the rare Cape Peninsula endemic.

Thus, by 1767 we know that at least four species of *Moraea* were in cultivation in Holland and at least one more in England.

1767.—No sooner had de la Roche published *Vieusseuxia* than Linnaeus (in 1767) described a third species, *M. iridioides*, clearly referring this species to Miller, *Figs. Pl., Tab. 239, fig. 1,* i.e., the rhizome-bearing *Dietes*. Later the same year, Linnaeus, in the 12th edition of the *Systema Naturae*, amplified *Moraea*, now with *M. vegeta* referred to Miller, *Figs. Pl., Tab. 238, figs. 1–2*, but *M. juncea* remained without a reference. From both Linnaeus' and Miller's treatments, it is clear that *Moraea* is a southern African genus of *iris*-like plants with both inner and outer tepals spreading and lacking a perianth tube: both cormous, bifacial-leafed and rhizomatous, equitant-leafed forms are included in this early circumscription.

The first two species which Linnaeus published, *M. vegeta* and *M. juncea*, have been the subjects of endless confusion (Barnard & Goldblatt, 1975). The complex situation is fully dealt with elsewhere, and it is sufficient here to explain that Miller, in edition 8 of *The Gardeners Dictionary*, misapplies the Linnaean epithets; thus, the name and description of *M. vegeta* is applied to *Tab. 239, fig. 1* (i.e., the rhizomatous *Dietes*, already described as *Moraea iridioides*), while *M. juncea* is applied to the second illustration on this plate, *Tritonia crocata*. There is no doubt that this was incorrect in view of Linneaus' clear referrals of *M. vegeta* to *Tab. 238* and of *M. iridioides* to *Tab. 239*; and in fact, in the abridged edition of 1771 the error is partly corrected, with *M. vegeta* applied to *Tab. 238, fig. 1,* but with the previously untypified *M. juncea* to *Tab. 238, fig. 2.* Nevertheless, Brown (1928) found reason to follow *The Gardeners Dictionary*, ed. 8, in making the combination *Dietes vegeta* (of which *M. iridioides* is a synonym). Brown also revived *M. juncea* for what is correctly *M. vegeta* [but which was at that time known by a later synonym, *M. tristis* (L.f.) Ker]. Brown's treatment was followed and as a result the nomen nudum, *M. juncea*, has come to be regarded as the type species of *Moraea* and is conserved as such at present in the *Botanical Code of Nomenclature.* A proposal to correct this is now in press.

Linnaeus published no further species of *Moraea,* though he did receive specimens of undescribed species from Anders Sparrman and from Carl Peter Thunberg, both of whom arrived in the Cape in 1772. Entries in Linnaeus' manuscript Mantissa no. 3 (fide Barnard, personal communication), indicate that he then intended to apply the name *M. juncea* (until that time untypified) to one of the plants which Sparrman sent him—namely what is now *M. gawleri* Spreng. After his father's death, the younger Linnaeus applied the epithet "iriopetala" to the specimen in question in his father's herbarium, and published this description in a confusing and illegitimate way under the name *M. iriopetala* var. *juncea* (for the typical variety) in the *Supplementum Plantarum.*

1778–1830: THE POST-LINNAEAN PERIOD—CLIMAX OF THE CAPZEIT IN HORTICULTURE

1778.—After Linnaeus's death in 1778, his son continued to work on the Mantissa 3, Linnaeus's unfinished manuscript which was published in 1781 as the *Supplementum Plantarum.* The younger Linnaeus added greatly to the work by borrowing from the soon-to-be-published manuscripts of Carl Peter Thunberg, and he incorporated descriptions of most of the Iridaceous plants collected by Thunberg at the Cape during a very productive 3-year period there.

The younger Linnaeus was strongly influenced by Thunberg's ideas, for he altered drastically the concept of *Moraea,* adopting Thunberg's ideas completely. The younger Linnaeus obviously did not completely understand the situation and his treatment is inconsistent. He placed under *Moraea* his father's manuscript description of *M. juncea* (i.e., of what is now *M. gawleri* Spreng.) using the epithet "*iriopetala,*" including as the only varieties, *M. juncea* and *M. vegeta.* At the same time, he included under *Iris* two species taken from Thunberg's manuscripts, *Iris crispa* (= *M. gawleri* Spreng.) and *I. tristis* (= *M. vegeta* L.), the former conspecific with his *M. iriopetala* var. *juncea.*

Thunberg's concept of *Moraea* was quite different from that of Miller and Linnaeus, and he considered what we now regard as *Moraea* to be South African species of *Iris.* Thunberg's own manuscript treatment of *Iris* was published in 1782. In this work, all of the 15 South African species mentioned by the younger Linnaeus are described in detail, while 3 more are added. It is of interest to note that the form of three specific epithets differs as follows: *Iris tricuspis* Thunb. = *I. tricuspidata* L.f.; *I. spathacea* Thunb. = *I. spathulata* L.f.; *Iris setacea* Thunb. = *I. setifolia* L.f. Most, if not all, of the younger Linnaeus's species of South African *Iris* cannot be identified from his descriptions nor from a specimen in the Linnaean herbarium. The types remained in Thunberg's collection and identification is possible only by consulting Thunberg's very detailed descriptions, as well as his herbarium specimens. Strictly speaking, because of the adoption of Thunberg's specific epithets, and of the reliance on Thunberg's published work, species which the younger Linnaeus described from Thunberg's manuscript should be cited as Thunb. ex L.f. This practice has traditionally not been followed, however, and for simplicity perhaps should not be adopted.

1787.—When Thunberg published his *Dissertatio de Moraea,* he included in this genus species occurring in Asia, Africa, and the New World, and these are now considered to comprise several different genera, namely, *Homeria, Aristea, Bobartia, Ferraria, Belamcanda, Sisyrinchium,* and *Hexaglottis.* These had in common simple style branches, fugaceous flowers, subequal spreading tepals, and the absence of petaloid crested style branches of *Iris* and true *Moraea.* Thunberg however included in *Moraea* two species which are still considered to belong to this genus, and it is problematic why these two, *M. polyanthos* and *M. crispa,* were not transferred to *Iris,* as would have been consistent. Perhaps the style crests were overlooked.

Thunberg maintained his incorrect application of *Moraea* until his death, and in all his works true species of *Moraea* are treated as *Iris.* Other botanists given the lead by Jacquin [*M. fugax* (de la Roche) Jacq. 1776] soon abandoned Thunberg's view. A dichotomy in the interpretation of *Moraea* developed from Thunberg's example and lasted until 1823. The German school as successor to the Linnaean tradition (Willdenow, Sprengel, and Roemer & Schultes, etc.) used *Iris* and occasionally *Vieusseuxia* as well for species of *Moraea,* while the English school, following Ker (1803), consistently used *Moraea* in the Linnaean sense, though the genus *Vieusseuxia* was often recognized for the species with tricuspidate inner tepals (Sweet, 1830).

The post-Linnaean period is one of intense interest in Cape plants and during this time several well-known plant collectors visited the Cape, continually bringing back novelties. Among these are Masson, Lichtenstein, Burchell, Boos, and Scholl, who collected for Jacquin, as well as Drège, Ecklon, and Zeyher. Jacquin illustrated several species of *Moraea,* some for the first time, but he described no new taxa.

In England, however, important work was done by John Bellenden Ker (Ker-Gawler) who systematically revised the Iridaceae (Ker, 1805, 1827). Though at first Ker used the name *Iris,* he soon reverted to the Linnaean circumscription of *Moraea,* transferring the younger Linnaeus' and Thunberg's South African species of *Iris* to *Moraea.* Ker added four new species to the genus over a 25-year period, *M. villosa, M. lurida, M. longiflora,* and *M. unguiculata* (including *M. tenuis* which Ker believed distinct).

1808.—Ventenat published two new genera, *Homeria* and *Hexaglottis,* both based on species previously regarded as *Moraea.* This contribution was not immediately accepted, for Ker continued to regard both as synonyms of *Moraea.* Sweet (1830) does however recognize both, and subsequent treatments accepted these segregated genera.

1812.—Though R. A. Salisbury's studies on the Iridaceae are noteworthy, the eccentric way in which he published his work makes much of it nomenclaturally invalid. Salisbury was the first to suggest *Moraea iridioides* might belong to a different genus, and he proposed *Dietes,* neglecting however to provide a generic description. He is also the first to suggest that what is today recognized as *Gynandriris* might be distinct from *Iris* and from *Moraea,* to which Ker had referred the well-known Mediterranean species, *Iris sisyrinchium.* Salisbury's

Diaphane is, however, also without a proper description. A third invalid genus *Helixyra,* based on *Moraea longiflora* was subsequently used by Klatt and Baker for representatives of *Gynandriris,* although at the subgeneric level.

1827.—Ecklon's *Topographisches Verzeichniss,* in which most of the monocotyledons collected by Ecklon and Zeyher are presented, is of little taxonomic significance since it is primarily a list of collections. Several new names are used, some for new species; however, while a few can be related to known plants, almost all the species of *Vieusseuxia* (Ecklon used *Moraea* for species of *Homeria* and *Gynandriris*) are synonyms or nomina nuda.

Publication of Ker's *Iridearum Generum* (1827) closes this period. In this essentially modern treatment of the family, *Moraea* is treated with *Vieusseuxia* as synonymous and including *Hexaglottis, Homeria* and *Gynandriris,* but not *Dietes.* Ker included 30 species in *Moraea,* and 24 of these are still recognized in the genus. This publication established the foundation for the work on *Moraea,* and in fact for the whole Iridaceae, by J. G. Baker and F. W. Klatt in the latter half of the nineteenth century.

1830–1896: THE PERIOD OF AFRICAN EXPLORATION

The intense interest in Cape plants was on the decline with other newly explored regions providing exciting subjects for horticulture. Nevertheless, settlement in South Africa proceeded towards the interior, while exploration into tropical Africa began. It soon became evident that *Moraea* was more widespread then had till then been believed.

1844.—Specimens collected by Schimper in Ethiopia were described by Hochstetter under the genus *Hymenostigma,* but both Hochstetter's species were soon recognized as belonging to the genus *Moraea.*

1853.—Welwitch's exploration of the Portuguese territory of Angola began in 1853, and during a long period of exploration in this vast area, he discovered several species of *Moraea* in the interior highlands. It was however only much later in 1878 that Welwitch's specimens were described by J. G. Baker.

1863.—Klatt's treatments of *Moraea* are notable for the recognition of *Homeria, Hexaglottis,* and *Dietes* as distinct genera. In miscellaneous papers published over a 30-year period, Klatt described several new species, based on collections made by Drège and by Ecklon and Zeyher in the 1820s. Most are now regarded as synonyms of earlier names, but Klatt is to be credited with *M. falcifolia,* while *M. fimbriata* (*M. fergusoniae* L. Bol.) is a later homonym. Klatt was, however, at variance with modern treatments in recognizing *Vieusseuxia* for the tricuspidate species (section *Vieusseuxia* here).

1896.—The nineteenth century ended with the production of major floristic works and Baker's treatments of *Moraea* in the *Handbook of the Irideae* (1892), *Flora Capensis* (1896), and *Flora of Tropical Africa* (1898) still stand today as the only complete references to *Moraea.* Baker included *Vieusseuxia* as a subgenus, and treated both *Dietes* and *Gynandriris* (as *Helixyra*) at the subgeneric level. These treatments include a good representation not only from the already well-known Cape area but from tropical African areas (now Rhodesia, Zambia, Angola and Malawi).

1896–1975: THE MODERN PERIOD

At the end of the nineteenth century the scene shifts from Europe to southern Africa where botanical activity stimulated by Harry Bolus began to bear fruit. South Africa was collected intensively, with Harry Bolus, Schlechter, and Peter MacOwan all active throughout the south. Some of their earlier discoveries were described by Baker and included in *Flora Capensis* but subsequently Louisa Bolus, Harry Bolus's niece, and G. J. Lewis, working in South Africa, added greatly to the understanding of *Moraea* in the Cape area. Louisa Bolus described nine species of *Moraea*, five recognized today, while Joyce Lewis added five species from 1933 to 1954.

At this time, plant collecting in tropical Africa, notably in Zaïre, then a Belgian colony, but also in Tanzania and Zambia, lead to the discovery of several more tropical African species. The good representation of *Moraea* in the African tropics, as well as in southern Africa, thus became increasingly evident.

1930.—The summer rainfall area of South Africa was neglected by South African botanists but this gap was filled by N. E. Brown who recognized 17 species of *Moraea* from the Transvaal, 13 of which were newly described.

1973.—As a follow-up to N. E. Brown's work on the Transvaal Iridaceae, I (Goldblatt, 1973) revised *Moraea* in the summer rainfall regions of South Africa recognizing 26 species in this area. With considerably more material at hand at this time it became evident that Brown followed too narrow a species concept, and eight of the species he recognized were reduced to synonymy.

1974–present.—With the current studies of *Moraea*, the overall understanding of the genus is now considerably clearer. The recent interest in the genus has resulted in the discovery and addition of 23 new species, as many as were correctly assigned to *Moraea* by Ker in 1827. Undoubtedly *Moraea* will yield further surprises, and several common species are still far from being perfectly understood. The study is, however, becoming urgent as the world's population expands and more land is needed for agriculture and pasture. Several species of *Moraea* in the Cape, particularly those with limited distributions, are in great danger of extinction, and even at the time of this publication, two species are in all probability extinct while another no longer occurs in the wild.

TAXONOMIC TREATMENT

Moraea Miller, Figs. Pl. 159, *tab.* 238. 1758, as *Morea* and altered to *Moraea* by Linnaeus, nom. cons. TYPE: *M. vegeta* L.

Vieusseuxia de la Roche, Diss. 31. 1766. TYPE: *V. spiralis* de la Roche = *M. bellendenii* (Sweet) N. E. Br.

Helixyra Salisb., Trans. Hort. Soc. London 1: 305. 1812, nom. nud., non sensu Baker et N. E. Br.

Freuchenia Eckl., Top. Verz. 14. 1827, nom. nud.

Phaianthes Raf., Fl. Tell. 4: 30. 1836. TYPE: *P. lurida* (Ker) Raf. = *M. lurida* Ker.

Hymenostigma Hochst., Flora 27: 24. 1844. TYPE: *H. schimperi* Hochst. = *M. schimperi* (Hochst.) Pichi-Serm.
Helixyra Salisb. ex N. E. Br., Trans. Roy. Soc. S. Africa 17: 348. 1929. TYPE: *H. flava* Salisb. = *Moraea longifolia* Ker.

Deciduous geophytic herbs. *Rootstock* a tunicate corm; tunics membranous, fibrous or reticulate. *Prophylls* several, membranous to fibrous, sheathing the underground part of stem. *Produced leaves* 1 to several, usually narrow, linear, falcate or coiled, terete or canaliculate with a minute equitant apex. *Stem* usually aerial, occasionally entirely subterranean, simple or branched, bearing reduced bractlike sheathing leaves at the upper nodes. *Inflorescence* a cymose corymb enclosed by 2 opposed spathes (occasionally 1 only); spathes herbaceous with dry acuminate apices or entirely dry, occasionally lacerated. *Flowers* several or solitary per spathe, borne serially, often fugaceous; tepals 6 (occasionally only 3) free or united in a tube in sect. *Tubiflora*; *outer tepals* unguiculate, larger than inner, marked with a conspicuous nectar guide; *inner tepals* petaloid and unguiculate, with a spreading limb, or entire and erect, or 3-lobed, cusplike, or absent. *Stamens* opposite the outer tepals and appressed to the style branches; *filaments* occasionally free or joined partly or entirely; *anthers* oblong to linear, extending to or occasionally exceeding the stigma lobe. *Style* slender, erect, branching at the apex of the filament tube; branches 3, divergent, flattened and petallike, with the stigma at the apex, above which are 2, petaloid crests (plumose in 1 species; reduced or lacking in several). *Ovary* ovoid, clavate, to linear, sometimes triangular, enclosed or emerging from the spathes. *Capsule* spherical to clavate. *Seeds* usually angled, occasionally with inflated testa, or flattened and triangular to discoid. Basic chromosome number $x = 10$; gametic numbers $n =$ 10, 9, 8, 6, 12, 20.

Distribution: montane and temperate regions of Africa south of the Sahara.

KEY TO THE SPECIES

1. Plants three to several branched; stems conspicuously sticky.
 2. Flowers large with the outer tepals more than 2.0 cm long and the spathes more than 2.5 cm long.
  3. Leaves 2 only, bracts and spathes obtuse .... 23. *M. bituminosa*
  3.' Leaves 2–4, bracts and spathes acute .... 24. *M. bubalina*
 2.' Flowers small with the outer tepals 2.3 cm long and the spathes less than 2.8 cm long.
  4. Flowers white; tepals spreading to partly reflexed, sweetly scented ... 25. *M. viscaria*
  4.' Flowers yellow; tepals spreading or completely reflexed, not sweetly scented.
   5. Style crests minute or not developed .... 27. *M. elsiae*
   5.' Style crests well developed .... 26. *M. inconspicua*
1.' Plants simple or branched; stems not sticky.
 6. Stem entirely subterranean or barely emergent; capsules borne at ground level borne at ground level within the inflorescence spathes.
  7. Flowers borne on a perianth tube; ovary enclosed in base of the spathe .... 22. *M. longiflora*
  7.' Tepals ± free; ovary exserted at flowering time.
   8. Corm tunics pale; leaves and/or spathes pubescent or at least the margins ciliate.
    9. Claw of the outer tepal 1.0–1.8 cm long, ± equal to the limb.
     10. Filaments 3–4 mm long; style crests broadly triangular .... 14. *M. tricolor*
     10.' Filaments 5–10 mm long; style crests linear-lanceolate 12. *M. ciliata*

9.′ Claw of the outer tepal 2.5–4 cm long, 2–3 times longer than the limb .... 13. *M. macronyx*

8.′ Corm tunics dark and coarsely fibrous; leaves not pubescent, occasionally ciliate on the margins .... 11. *M. falcifolia*

6.′ Stem produced above ground, usually at least several cm high; capsules usually exserted from, or borne just below the apices of inflorescence spathes.

11. Produced leaves 2 or more.

12. Leaves 2 only, both produced well above the ground and inserted close together just below the first branch .... 20. *M. fugax*

12.′ Leaves not as above, either several or if 2, at least the lower basal.

13. Stems scabrid to pubescent (occasionally very sparsely so).

14. Leaves glabrous; capsules flexed to pendant .... 3. *M. vegeta*

14.′ Leaves usually lightly pubescent, at least with ciliate margins; capsules erect .... 6. *M. papilionacea*

13.′ Stem glabrous.

15. Leaves coiled or undulate or with the margins undulate to crisped.

16. Filaments joined in the lower half (or free).

17. Leaf margins crisped .... 2. *M. gawleri*

17.′ Leaf margins lightly undulate or straight (or the leaf terete).

18. Leaves channeled (rarely terete) often villous, variously coiled; inner tepals erect .... 8. *M. serpentina*

18.′ Leaves terete, helicoid; inner tepals reflexed .... 9. *M. tortilis*

16.′ Filaments free near the apex only .... 5. *M. fergusoniae*

15.′ Leaves erect to falcate, the margins straight.

19. Flowers blue.

20. Style crests plumose .... 10. *M. lugubris*

20.′ Style crests paired, entire.

21. Inner tepals reduced to a short cusp .... 35. *M. tripetala*

21.′ Inner tepals with an expanded limb.

22. Other tepals more than 3.3 cm long; .... 31. *M. polystachya*

22.′ Outer tepals less than 3.0 cm long; flowering August–October(–November) .... 32. *M. polyanthos*

19.′ Flowers not blue, either yellow or cream to brick red.

23. Stems tall, branching repeatedly.

24. Inner tepals absent; tepals forming a perianth tube .... 21. *M. cooperi*

24.′ Inner tepals well developed; tepals entirely free.

25. Leaves 3 or more.

26. Leaves produced from the base .... 1. *M. ramosissima*

26.′ Lower part of the stem leafless, lower leaves inserted well above ground .... 4. *M. indecora*

25.′ Leaves 1 or 2 .... 2. *M. gawleri*

23.′ Stems short, branching from near the base only or from the lowest aerial node.

27. Leaf ± erect, the margins straight .... 7. *M. margaretae*

27.′ Leaf somewhat twisted, the margins undulate .... 5. *M. fergusoniae*

11.′ Produced leaves solitary.

28. Inner tepals entire, the limb expanded, ensiform to lanceolate or ovate (not trilobed-tricuspidate).

29. Leaf inserted well above ground level just below the first branch; ovary and capsule beaked.

30. Outer tepals 1.8–2.8 cm long; spathes 2.5–4 cm long; plants more than 30 cm high .... 19. *M. gracilenta*

30.′ Outer tepals 2.8–4.0 cm long; spathes 4–8 cm long; if tepals shorter, then plants less than 20 cm high .... 20. *M. fugax*

29.′ Leaf ± basal or inserted shortly above ground level; capsule rarely beaked.

31. Leaves terete.

32. Inflorescence spathes and bracts acute-acuminate; ovary not angular-winged.

33. Leaf coiled below the apex only .... 15. *M. saxicola*

33.′ Leaf uniformly coiled throughout its entire length .... 9. *M. tortilis*

32′. Inflorescence spathes and bracts often obtuse to truncate; ovary angular to winged.

34. Filaments joined at the base only (less than 2 mm).

35. Style branches exceeding the crests; nectar guide lined with dots .... 30. *M. neglecta*

35.′ Style branches not exceeding the crests; nectar guide clear, circled with darker color .... 28. *M. angusta*

34.′ Filaments joined at least 3 mm and up to half their length .... 29. *M. anomala*

31.′ Leaves channeled.

36. Stamens exceeding the style crests.

37. Stem and usually leaves pubescent .... 46. *M. neopavonia*

37.′ Stem and leaves glabrous .... 43. *M. insolens*

36.′ Stamens not exceeding the style crests.

38. Outer tepals exceeding 3.5 cm, and inflorescence spathes more than 8 cm long .... 54. *M. spathulata*

38.′ Outer tepals less than 3.5 cm long, or if longer spathes no more than 7 cm long.

39. Inner tepals erect and not as long as the style branches .... 34. *M. algoensis*

39.′ Inner tepals much longer than the style branches, not necessarily erect.

40. Filaments united almost to the apex, free for ± 1 mm.

41. Filaments 3–4 mm long.

42. Spathes ± 4 cm long .... 50. *M. amissa*

42.′ Spathes 1.2–1.4 cm long .... 33. *M. nubigena*

41.′ Filaments more than 5 mm long.

43. Limb of outer tepals longer than the claw .... 38. *M. incurva*

43.′ Limb of outer tepals shorter than the claw .... 42. *M. lurida*

40.′ Filaments not united to the apex, at least the upper third free.

44. Leaf with thickened hyaline margins.

45. Anthers ca. 4 mm long; outer tepals no more than 8 mm wide .... 16. *M. macgregorii*

45.′ Anthers more than 5 mm long; outer tepals more than 1 cm wide.

46. Leaf seldom exceeding 20 cm, with markedly undulate margins; flowers usually yellow .... 18. *M. bolusii*

46.′ Leaf more than 25 cm long, occasionally with slightly undulate margins; flowers white to pale blue .... 15. *M. saxicola*

44.′ Leaf margins not thickened.

47. Filaments free almost to the base .... 40. *M. thomasiae*

47.′ Filaments united for half to two-thirds of their length.

48. Filaments 1.3–1.5 cm long; mountains of the western Cape .... 39. *M. barkerae*

48.′ Filaments up to 1 cm long; southern South West Africa .... 17. *M. namibensis*

28.′ Inner tepals either trilobed to tricuspidate, or filiform to minute or absent.

49. Filaments united for at least half their length, usually free near the apex only.

50. Stem and/or leaf pubescent.

51. Anthers much exceeding the style crests.

52. Style crests obsolete, not exceeding the stigma .... 47. *M. gigandra*

52.′ Style crests ca. 2 mm long, extending above the stigma .... 46. *M. neopavonia*

51.′ Anthers shorter than the style branches or barely exceeding them, but not exceeding the style crests.

53. Inner tepals filiform; stem glabrous .... 36. *M. debilis*

53.′ Inner tepals flattened and grooved below; stem pubescent.

54. Flowers orange; style crests ca. 2 mm long .... 52. *M. tulbaghensis*

54.′ Flowers blue, purple, pink, or cream; style crests usually exceeding 3 mm.

55. Outer tepals with the claw and part of the limb heavily bearded; nectar guide obscure and without a yellow eye .... 53. *M. loubseri*

55.′ Outer tepals not black bearded.

56. Outer tepals at least 3 cm long and with a conspicuous nectar guide of yellow surrounded by a broad dark band .... 51. *M. villosa*

56.′ Outer tepals not exceeding 2.8 cm and with a very small nectar guide, either yellow or dark .... 48. *M. caeca*

50.′ Stem and leaf glabrous.

57. Filaments exceeding 1 cm, free in the upper third .... 39. *M. barkerae*

57.′ Filaments less than 1 cm long, usually free near the apex only.

58. Flowers blue-violet.

59. Inner tepals exceeding the stigmas .... 50. *M. amissa*

59.′ Inner tepals not reaching the stigmas .... 34. *M. algoensis*

58.′ Flowers not blue-violet.

60. Inner tepals with the central cusp linear and outspread, much exceeding the lateral cusps or lobes.

61. Flowers white with a large dark nectar guide with a large yellow or blue center .... 49. *M. aristata*

61.′ Flowers purple with a very small black or yellow nectar guide .... 48. *M. caeca*

60.′ Inner tepals with the central cusp tapering, or if linear, then coiled inwards and not exceeding the lateral lobes more than twice.

62. Outer tepals cupped to ± outspread; 2.5–3.5 cm long.

63. Claw of outer tepals glabrous to papillate .... 42. *M. lurida*

63.′ Claw of outer tepals pubescent.

64. Filaments 3–5 mm long; flower yellow .. 45. *M. bellendenii*

64.′ Filaments 5–6 mm long; flower white-cream .... 44. *M. tricuspidata*

62.′ Outer tepals sharply reflexed from 45° to 90°; seldom exceeding 2.2 cm in length .... 41. *M. unguiculata*

49.′ Filaments united near the base only or for less than a third of their length.

65. Flowers white, marked with blue; tepal margins lightly crisped .... 37. *M. barnardii*

65.′ Flowers blue to purple not speckled; tepal margins not crisped .... 35. *M. tripetala*

I. Subgenus MORAEA

Subgenus **Moraea**. TYPE: *Moraea vegeta* L.

Plants small to large, several to many branched, the stem rarely simple. *Corm* tunics various, never bituminous. *Leaves* solitary to several. *Stem* produced above ground or entirely subterranean; nodes smooth. *Flowers* generally unspecialized; inner tepals entire, spreading, occasionally reduced and tricuspidate or lacking. *Capsules* exserted or enclosed, spherical, clavate or cylindrical, beaked in a few species; *seeds* small, rounded to angular. Basic chromosome numbers, $x = 10, 9, 8, 6$.

Distribution: Entire winter rainfall area from southern South West Africa in the north to Grahamstown in the east, with a few species extending into the summer rainfall areas of the karoo and East Griqualand.

Subgenus *Moraea* comprises a rather heterogeneous assemblage of species. While there is a variety of vegetative habits, flowers of most species are similar and quite unspecialized with comparatively large, entire tepals. Uniform floral morphology as well as a distinctive series of karyotypes serve to unite this group. All the species in the subgenus with the basic chromosome number $x = 10$ have 3–5 long acrocentric chromosome pairs and a corresponding number of much smaller ones.

The many-leafed and branched habit is regarded as ancestral in *Moraea*, and section *Moraea* probably stands in such a position, not only in subgenus *Moraea* but to the specialized subgenera *Grandiflora* and *Vieusseuxia* that have reduced branching, a single leaf, and the derived basic chromosome number, $x = 6$. Morphological features of subgenera *Monocephalae* and *Visciramosa*, which like subgenus *Moraea* have $x = 10$, make it unlikely that they are directly related to section *Moraea*, and all three are probably derived from an extinct common ancestor.

The few species with chromosome numbers lower than $n = 10$ have derivative karyotypes as a result of chromosomal rearrangements accompanying the aneuploid reduction.

Section 1. **Moraea.** TYPE: *Moraea vegeta* L.

Moraea subgenus *Eumoraea* section *Corymbosae* Baker, Fl. Cap. 6: 10. 1896.

Plants small to large, several to many branched. *Corm* tunics of light or dark, fine to coarse fibers. *Leaves* 2 to several, basal and/or cauline. *Stems* rarely simple, usually several branched. *Flowers* usually with all tepals reflexed or outspread; inner tepals usually entire, occasionally tricuspidate. *Capsules* spherical to clavate, exserted; *seeds* small, angular. Basic chromosome numbers $x = 10, 9, 8$.

Distribution: Entire winter rainfall area from Grahamstown in the east to Namaqualand.

Section *Moraea* comprises a varied range of species, all of which have more than a single leaf and are usually several branched. The base number is $x = 10$ excepting *M. papilionacea* with $n = 9$ and *M. indecora* with $n = 8$. *Moraea margaretae* with $n = 20$ is the only polyploid species in the section.

1. **Moraea ramosissima** (L.f.) Druce, Bot. Soc. Exch. Club. Brit. Isles. 4: 636. 1914.

Iris ramosissima L.f. Suppl. Pl. 99. 1781. TYPE: South Africa, Cape, sandy places in the Swartland, *Thunberg s.n.* (Herb. Thunberg 1169, UPS, lectotype).
I. ramosa Thunb., Diss. Irid. no. 24. 1782. TYPE: As for *I. ramosissima* L.f.
Moraea ramosa (Thunb.) Ker, Bot. Mag. *tab. 771.* 1804; Baker, Fl. Cap. 6: 1896.
M. bulbifera Jacq., Hort. Schoenb. 2: 38, *tab. 197.* 1797. TYPE: Illustration in Hort. Schoenb. *tab. 197* (lectotype).
Freuchenia bulbifera Eckl., Top. Verz. 14. 1827, nom. nud.
Vieusseuxia freuchenia (Eckl.) Steud., Nom. Bot. 2: 765. 1841, nom. inval.

Plants large, 50–120 cm, much branched. *Corm* 2–3 cm in diameter, producing many cormlets round the base; rootstock enclosed in a network of spinous roots. *Leaves* many, distichous, canaliculate, to 30 cm long and 1.5 cm wide, falcate. *Stem* terete or grooved above the nodes, branching repeatedly from the base to the apex. *Spathes* herbaceous with dry, acute to attenuate apices; inner spathe 2–2.5 cm long, the outer much shorter, less than 1 cm long. *Flowers* few per spathe, bright yellow; tepals all reflexed to 45°, the outer somewhat larger than the inner, ca. 3 cm long and to 1.5 cm wide. *Filaments* 12–15 mm long, entirely free or joined near the base only; *anthers* ca. 1 cm long. *Style branches* 2–2.5 cm long, the crests linear-lanceolate. *Capsule* ± spherical, truncate at the apex, ca. 6 mm in diameter; *seeds* angled. Chromosome number $2n = 20$.

Flowering time: October to December, typically late flowering.

Distribution: Widespread in moist places in sandy soils, mountains and flats from the Cedarberg in the north to Grahamstown in the east.—FIG. 7.

Moraea ramosissima, a species known for some time by the synonym *M. ramosa*, is one of the tallest in the genus. It is regarded as the most primitive species of *Moraea* because of its numerous leaves, abundant branching, and the unspecialized nature of the flower. Its very distinctive habit and size ensure that it is never confused with other species. Its closest relative is probably *M. gawleri*, a much smaller plant, which is similar in having a branched axis and small inflorescence spathes.

Moraea ramosissima has the unique characteristic in the genus of spinous roots, a feature described in detail by Lewis (1954). The modified roots form a basketlike network around the corm and probably have a protective function. They do not however prevent massive depradations by baboons, who uproot large numbers of plants in search of the corms. The survival of such populations is assured by the production of cormlets which *M. ramosissima* sheds in large numbers from the base of the main corm and also from the lower aerial nodes.

Moraea ramosissima is comparatively widespread within the winter rainfall area and occurs primarily in mountain areas, always in wet situations, either along streams, seepage zones, or below cliffs. It ranges from the Giftberg and Cedarberg in the north to Grahamstown in the east and is particularly abundant on the Cape Peninsula.

SOUTH AFRICA. CAPE: 31.18 (Van Rhynsdorp): Giftberg Mountain (D), *Bayliss 6098* (MO).

32.18 (Clanwilliam): Near Clanwilliam (BB), *Galpin 10514* (BOL, BR, PRE); *Leipoldt s.n.* (SAM-20579).

32.19 (Wuppertal): Elandskloof (CA), *Lewis 842* (SAM). Warm Baths, Olifants River valley, *Edwards s.n.* (BOL-14416).

33.18 (Cape Town): Claremont, Cape Town (CD), *Wolley Dod 504* (BOL, K). Kirstenbosch, *Bolus 3261* (BOL). Skeleton Gorge, *Leighton 737* (BOL). Blinkwater, *Cassidy 86* (NBG). Head of Jonkershoek valley (DD), *Esterhuysen 9700* (PRE).

33.19 (Worcester): Winterhoek, Tulbagh (AA), *Pappe s.n.* (SAM-25174). Grootwinterhoek, *Marloth 1728* (PRE). Bains Kloof (CA), *Gillet 4518* (BOL). Baviaans Kloof, *Lewis 982* (SAM). Zachariashoek, Kasteels Kloof (CC), *Smith 63* (PRE). Louwshoek mountains (CD), *Stokoe s.n.* (SAM-58746).

33.20 (Montagu): Below 10 o'clock Peak (CD), *Wurts 452* (NBG). Grootvadersbosch (DD), *Jackson s.n.* (NBG-58808).

33.22 (Oudtshoorn): George (CD), *Sister Stephany s.n.* (BOL). Montagu Pass, *Penther 757* (M, S). Karatara, Zuur Rug (DD), *Keet 1151* (GRA).

33.23 (Willowmore): Ratelsbosch, Tsitsikama Forest (DC), *Fourcade 370* (BOL, GRA).

33.24 (Steytlerville): Groot River (DA), *Barker 6056* (NBG).

33.25 (Port Elizabeth): Witteklip (CC), *MacOwan 399* (BOL, K).

33.62 (Grahamstown): Grahamstown (BC), *MacOwan s.n.* (SAM-20580). Howisons Poort, *Britten 2826* (GRA).

34.18 (Simonstown): Smiths Farm, Cape Peninsula (AD), *Barker 7171* (NBG). Brightwater, Cape Point Nature Reserve, *Lewis 2278* (SAM). Sir Lowry's Pass (BB), *Rogers 26950* (PRE) Arieskraal (BD), *Barker 3357* (NBG). Porter Reserve, Bettys Bay, *Ebersohn 138* (NBG).

34.19 (Caledon): Near Bot Rivier (AA), *Schlechter s.n.* (PRE). Onrus River (AC), *Gillet 4399* (BOL, MO). Riviersonderend (BB), *Zeyher s.n.* (SAM-48586); *Ecklon & Zeyher 1645* (S).

34.23 (Knysna): Storms River mouth (BB), *Acocks 21179* (PRE).

2. **Moraea gawleri** Spreng., Syst. Veg. 5 (Index): 462. 1828, nom. nov. pro *M. crispa* (L.f.) Ker.—Fig. 6A–C.

M. crispa (L.f.) Ker, Bot. Mag. *tab. 754.* 1804; Baker, Fl. Cap. 6: 15. 1896, incl. var., non Thunb. 1787, hom. illeg.

M. crispa var. *rectifolia* Baker, Fl. Cap. 6: 16. 1896. TYPE: South Africa, Cape, Table Mountain, *H. Bolus 4718* (BOL).

Iris crispa L.f., Suppl. Pl. 98. 1781. TYPE: South Africa, Cape, hills near Cape Town, *Thunberg s.n.* (Herb. Thunberg 1120, UPS, lectotype; S, isolectotype)

Moraea undulata Ker,[5] Irid. Gen. 43. 1827, nom. nov. pro *M. crispa* (L.f.) Ker, hom. illeg., non *M. undulata* (L.) Thunb., 1787.

Vieusseuxia brehmii Eckl., Top. Verz. 12. 1827, nom. nud.

V. angustifolia Eckl., Top. Verz. 12. 1827, nom. nud.

Moraea decussata Klatt, Abh. Naturf. Ges. Halle 15: 367. 1882. TYPE: South Africa, *Krauss 1447* (V, holotype, destroyed; authentic material at S).

M. sulphurea Baker, Bot. Mag. *tab. 7658.* 1889. TYPE: Illustration in Bot. Mag. *tab. 7658.*

Plants 15–45 cm high, usually several branched. *Corm* 5–15 mm in diameter; tunics usually light brown, the fibers coarse and vertically ridged. *Leaves* 2 (rarely 1 only), the lower basal, the upper produced from the lowest aerial node; linear and ± erect or spreading and somewhat coiled, the margins plane, undulate or crisped, glabrous, 1–6 mm wide. *Stem* rarely simple, usually 3–5-branched. *Spathes* herbaceous or dry towards the apex, acute, seldom attenuate; inner spathe 1–2.5 cm long, the outer ca. half the length of the inner. *Flowers* few per spathe, yellow, cream or pale brick; outer tepals 1.2–2.8 cm long, the claw somewhat less than half, the limb 0.5–1.4 cm wide; inner tepals 1–2 cm long, also reflexed. *Filaments* ca. 6 mm long, united for ca. half their length; *anthers* 2–3 mm long, red or yellow. *Style* branched at the apex of the filament tube, the branches to 8 cm long, the crests lanceolate. *Capsule* ± spherical, ca. 5 mm in diameter; *seeds* angular. Chromosome number $2n = 20$, $2n = 24, 26$ $(x = 10)$.

Flowering time: July to September, to October in the south.

Distribution: Clay flats and slopes, usually in Renosterbosveld, occasionally in sandy situations, widespread from Namaqualand in the north to Humansdorp in the east.—Fig. 7.

The rather small, slender *Moraea gawleri* is most easily recognized by its small inflorescence spathes, the outer of which is seldom more than 1 cm long. Though 2 crisped leaves are the rule, both solitary-leafed, and straight-margined forms occur, the latter in moister habitats. The straight-margined form, described

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[5] Baker used this name for the true *M. crispa* Thunb. and not in Ker's sense (Fl. Cap. 6: 19. 1896.).

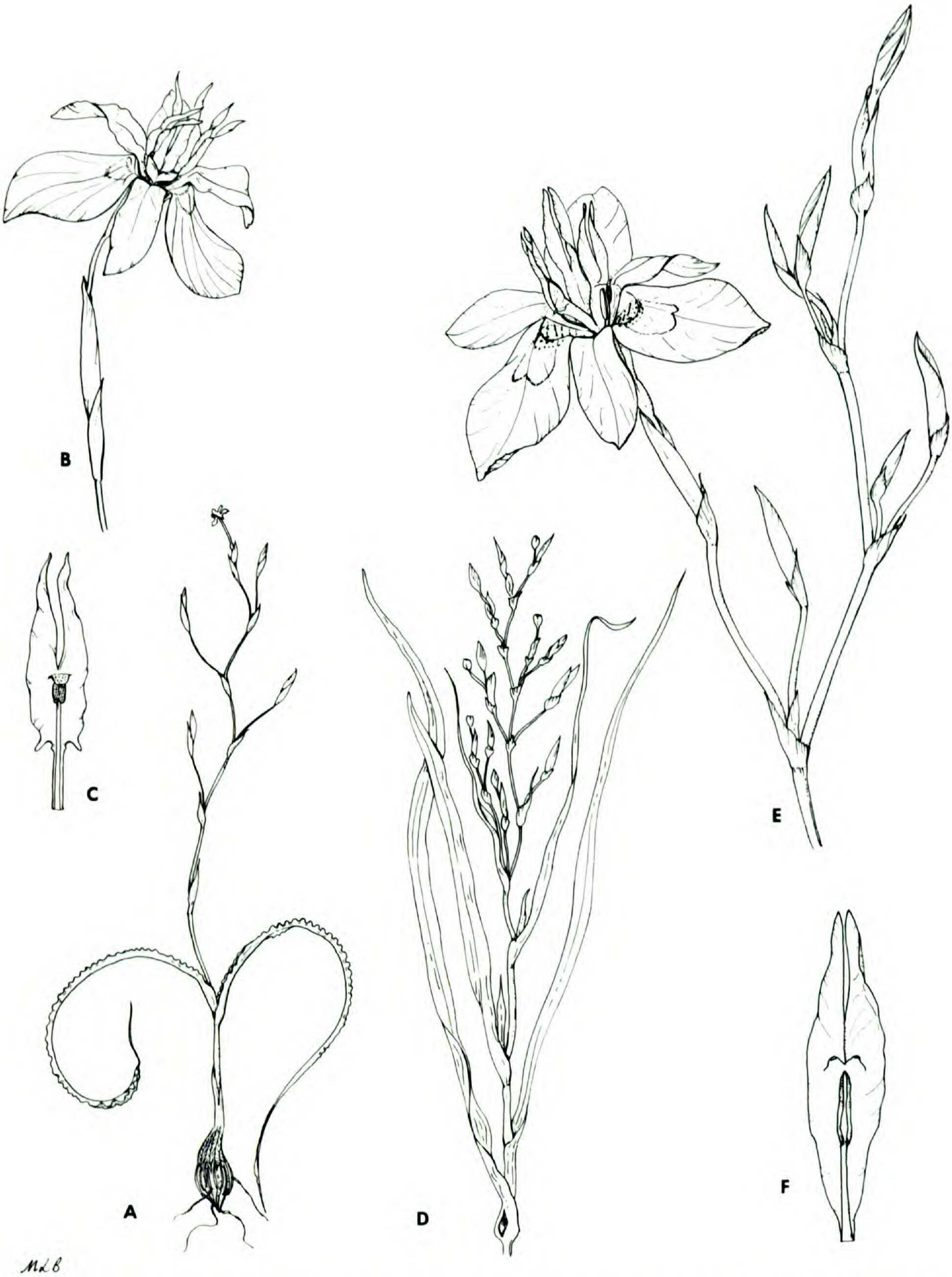

Figure 6. *Moraea* species.—A–C. *M. gawleri.*—A. Habit (× 0.3).—B. Flower (life size).—C. Style branch and stamen (× 2).—D–F. *M. ramosissima.*—D. Habit (× 0.25).—E. Flower (life size).—F. Style branch and stamen (× 2).

as *M. crispa* var. *rectifolia* by J. G. Baker, is not recognized in this treatment as there are populations in which all possible leaf types from straight edged to very crisped occur side by side, indicating that the variety has no taxonomic validity. *Moraea gawleri* is most closely allied to *M. ramosissima*, though it is a much

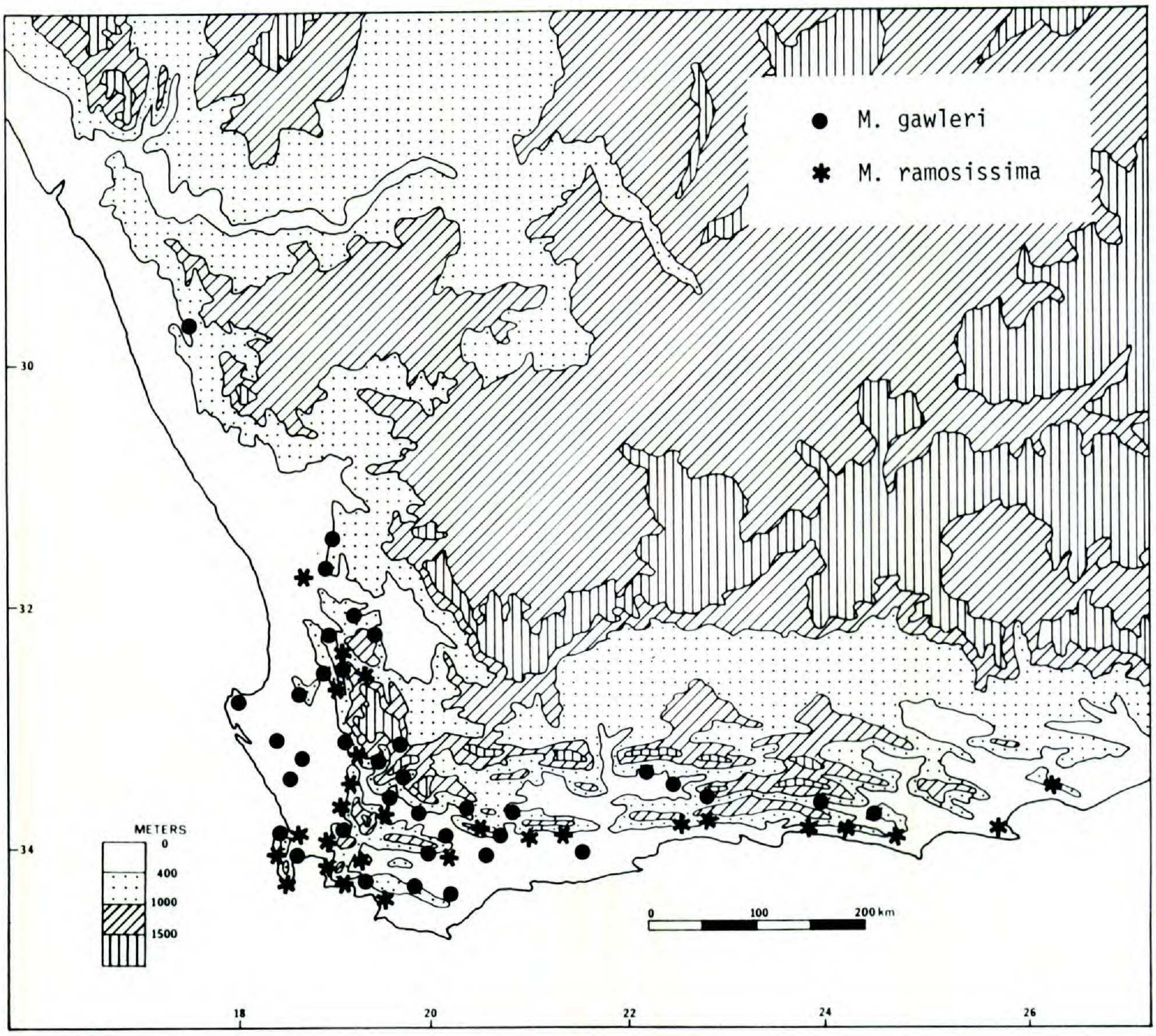

FIGURE 7. Distribution of *Moraea gawleri* and *M. ramosissima*.

smaller plant. Flowers are usually a bright yellow to buff color, but a brick red form is found along the west coast in dry situations as far north as Nieuwoudtville. Occasionally populations with red tepals and yellow style crests are encountered, notably in the south where the red and yellow colored forms both occur.

Moraea gawleri has perhaps the widest range of the Cape species of *Moraea* and occurs over almost the entire winter rainfall zone. It is represented by a relict population on Spektakelberg, west of Springbok in Namaqualand, and occurs almost continuously from Nieuwoudtville to the Cape Peninsula and eastwards to the Longkloof in the Humansdorp district. Except on the Cape Peninsula where it does grow in sandy situations, it is confined to clay soils and is often found in rather dry places.

Originally described as *Iris crispa* L.f., based on a Thunberg collection, this plant has had an unfortunate taxonomic history. *Moraea crispa* Thunb., quite a different plant, blocks the legitimate transfer of *Iris crispa* to *Moraea*. When Ker (1827) realized his error in transferring the species to *Moraea*, he proposed the new name *M. undulata*. This also proved to be a homonym, for *M. undulata*

(L.) Thunb. (the familiar *Ferraria undulata*). Sprengel provided the name *M. gawleri*, the second new name given to this plant, and the one which must now be used. In spite of its being a homonym, *M. crispa* (L.f.) Ker was applied to this species in *Flora Capensis* by J.G. Baker who also ignored Klatt's *M. decussata*, a new species, which the latter author evidently intended to replace the illegitimate combination *M. crispa* (L.f.) Ker.

Baker's *M. sulphurea* is somewhat hesitantly included here as a synonym of *M. gawleri*. The type illustration agrees generally with this species, but it is unusual in having no branches, and the leaves are without the usual crisping. These discrepancies may, however, be due to the affects of cultivation rather than indicative of any fundamental differences between *M. sulphurea* and more usual forms of *M. gawleri*.

SOUTH AFRICA. CAPE: 29.17 (Springbok): Spektakelberg (DA), *Goldblatt 627* (BOL); *Thompson 1020* (PRE, STE).

31.18 (Van Rhynsdorp): Giftberg plateau (DC), *Barker 9593* (NBG); *Goldblatt 359* (BOL). Olifants River barrage (DD), *Barker 1332* (NBG).

31.19 (Calvinia): Near Nieuwoudtville (AC), *L. Bolus s.n.* (BOL-19838). Top of Van Rhyns Pass, *Goldblatt 223* (BOL). 20 km SW of Nieuwoudtville, *Acocks 19473* (BOL, M, NBG).

32.17 (Vredenburg): Steenberg's Cove (DB), *Taylor 1531* (SAM).

32.18 (Clanwilliam): Near Clanwilliam Dam (BB), *Stokoe s.n.* (SAM-60191). Nardouw Pass, *Stokoe s.n.* (SAM-55677). Alpha, at Algeria turnoff (BD), *Goldblatt 288* (BOL). Kapteins Kloof, Piketberg (DC), *van Niekerk 622* (BOL). Near Piketberg (DD), *Barnes s.n.* (BOL); *Lewis s.n.* (BOL).

32.19 (Wuppertal). Welbedacht, Cedarberg (AA), *Barker 263* (NBG). Bidouw valley pass, *Thompson 340* (PRE, STE). Warm Baths, Olifants River valley (CA), *Edwards s.n.* (BOL-14435). *Leipoldt s.n.* (BOL, K), *Pearson 7338* (K).

33.18 (Cape Town): Zout River, Hopefield (AB), *Garside 1602* (K). Darling (AD), *H. Bolus s.n.* (BOL, BR). Mamre hills, *van Niekerk 262* (NBG); *Barker 3843* (BOL, NBG). Moorreesburg (BA), *H. Bolus 9990, 9988* (BOL, BR, PRE). Kenilworth, Cape Peninsula (CD), *H. Bolus s.n.* (BOL). Signal Hill, Cape Peninsula, *Wolley Dod 1599* (BOL, K); *H. Bolus 4980* (BOL); *Marloth 1557* (PRE); *Page s.n.* (BOL-16754). Table Mountain above Klaasenbosch, *H. Bolus 4718* (BOL). Agter Paarl (DB), *Barker 431* (NBG). Swartboskloof, Jonkershoek (DD), *Lewis 1651* (BOL, SAM). Onderpapegaaisberg, *Taylor 5031* (PRE, STE).

33.19 (Worcester): De Hoek, Saron (AA), *Barker 5852* (NBG). Tulbagh Road, station (AC), *Goldblatt 218* (BOL). Karoopoort (BA), *L. Bolus s.n.* (BOL-19916). Hottentots Kloof, *Barker 3020* (NBG). Lakenvlei (BC), *Barker 1331* (NBG). De Doorns, Hex River valley, *H. Bolus 13194* (BOL); *Marloth 2010* (PRE). Near Worcester (CB), *Leipoldt s.n.* (BOL). Karoo Garden, *Stayner s.n.* (NBG-90759); *Olivier 106* (PRE, STE). Rabiesberg (DA), *Lewis s.n.* (BOL). 3 km E of Robertson (DD), *Acocks 16106* (PRE).

33.20 (Montagu): Keur Kloof, Montagu (BC), *Compton 5697* (NBG). Bonnievale (CC), *Dymond s.n.* (BOL); *Marloth 11825* (PRE). Below Crown Mountain, Swellendam (CD), *Barker 277* (NBG); E of Barrydale (DC), *Hall 1432* (NBG).

33.22 (Oudtshoorn): Ca. 30 km E of Camphor Station, Longkloof (DC), *Mauve 4572* (PRE, STE). Near Keurbooms River, Longkloof (DD), *Fourcade 4689* (BOL, SAM).

33.24 (Steytlerville): Bo Plaas, *Bayliss 5969* (NBG, MO, PRE).

34.18 (Simonstown): Above Llandudno, Cape Peninsula (AB), *Salter 6240* (BOL, K); *Hafstrom & Acocks 317* (PRE). Cape Point Reserve (AD), *Compton 18300* (BOL, NBG).

34.19 (Caledon): Near Hermanus (AC), *H. Bolus s.n.* (BOL). 21 km E of Caledon (BA), *Story 3072* (PRE). Riviersonderend (Appelskraal) *Zeyher 4088* (PRE). Napier (BD), *Bond 476* (NBG).

34.20 (Bredasdorp): Bontebok Park, Swellendam (AB), *Liebenberg 6457* (PRE, STE). Tradouw Pass (BA), *Marloth 8628* (PRE). Bredasdorp (CA), *Loubser 888* (NBG).

34.21 (Riversdale): Near Riversdale (AB), *Muir 2687* (BOL).

3. **Moraea vegeta** L.,[6] Sp. pl., ed. 2. 59. 1762; Syst. Nat., ed. 12. 78. 1767. TYPE: Illustration in Miller, Figs. Pl. 2, *tab.* 238. 1758.—FIG. 8.

Iris tristis L.f. Suppl. P. 97. 1781. TYPE: South Africa, Cape, below Devils Peak, near Cape Town, *Thunberg s.n.* (Herb. Thunberg 1190, UPS, lectotype).
Moraea tristis (L.f.) Ker, Ann. Bot. (König & Sims) 1: 241. 1805; Baker, Fl. Cap. 6: 18. 1896.
Ferraria tristis (L.f.) Salisb., Prodr. Stirp. 42. 1796.
Moraea iriopetala L.f., Suppl. Pl. 100. 1781, nom. illeg., superfl. pro *M. vegeta* L.
M. sordescens Jacq., Ic. Pl. Rar. *tab.* 225. 1795; Coll. 5: 29. 1797. TYPE: Illustration in Jacq., Ic. Pl. Rar.
Vieusseuxia graminifolia Eckl., Top. Verz. 11. 1827. TYPE: South Africa, Cape, "Groene Berg," *Zeyher 1068* (S, lectotype).
V. rivularis Eckl., Top. Verz. 11. 1827, nom. nud.
"*Moraea juncea* L." sensu N. E. Brown, J. Linn. Soc. Bot. 48: 42. 1928.

Plants (10–)15–30 cm high, usually several branched. *Corms* 1–2 cm in diameter; tunics of fine, pale fibers. *Leaves* several, produced from the base and the aerial nodes, the lower linear, exceeding the inflorescence, glabrous, glaucous, often dry and torn at the apex. *Stem* several branched, markedly puberulous. *Spathes* herbaceous, occasionally with brown apices; inner spathes 2–4 cm long, the outer 1.5–3 cm. *Flowers* few per spathe, dull yellow to brown, flushed with blue or purple; outer tepals 2–2.5 cm long, lanceolate, the limb to 1.8 cm long; inner tepals smaller, also reflexed. *Filaments* 5–6 mm long, joined in the lower third; *anthers* 3–4 mm, acute, blue. *Style branches* 7–8 mm long, the lanceolate crests 7–10 mm long. *Capsule* ± spherical, soft walled and showing impression of seeds, pendulous when mature, ca. 8 mm in diameter; *seeds* round to angular. Chromosome number $2n = 20$.

Flowering time: September and October.

Distribution: Common on the Cape Peninsula and north to the Darling area on heavy, usually clay soils; also recorded from the Swellendam and Tulbagh districts.—FIG. 8.

Moraea vegeta with its several characteristic glaucous leaves, puberulous stem, and somewhat pendulous capsules is not easily confused with related species with similar flowers such as *M. papilionacea* and *M. gawleri*. Its closest allies are probably *M. papilionacea* whose range covers that of *M. vegeta*, and also the newly discovered *M. indecora*, known only from the area near Springbok in Namaqualand. *Moraea indecora* is a large species which has a similar subpendulous capsule; its smooth elongated stem and large red stamens are, however, quite different from those of *M. vegeta*.

Moraea vegeta is one of the few species of the genus which has adapted to human settlement, and it is most common, almost weedy, in parts of the Constantia area of the Cape Peninsula where it thrives under the naturalized oaks and pines. Elsewhere it is found in open, sunny situations and always on a heavy soil, usually clay.

The nomenclatural history of *M. vegeta*, the type species of the genus, is complex. Until recently the species was known as *M. juncea* L. (Brown, 1928), but

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[6] *Moraea vegeta* in Miller's sense (Gard. Dict. ed. 8. 1768.) refers to *Dietes* (*Moraea*) *iridioides* (L.) Sweet ex Klatt; similarly *D. vegeta* sensu N. E. Brown refers to *D. iridioides* (see Barnard & Goldblatt, 1975).

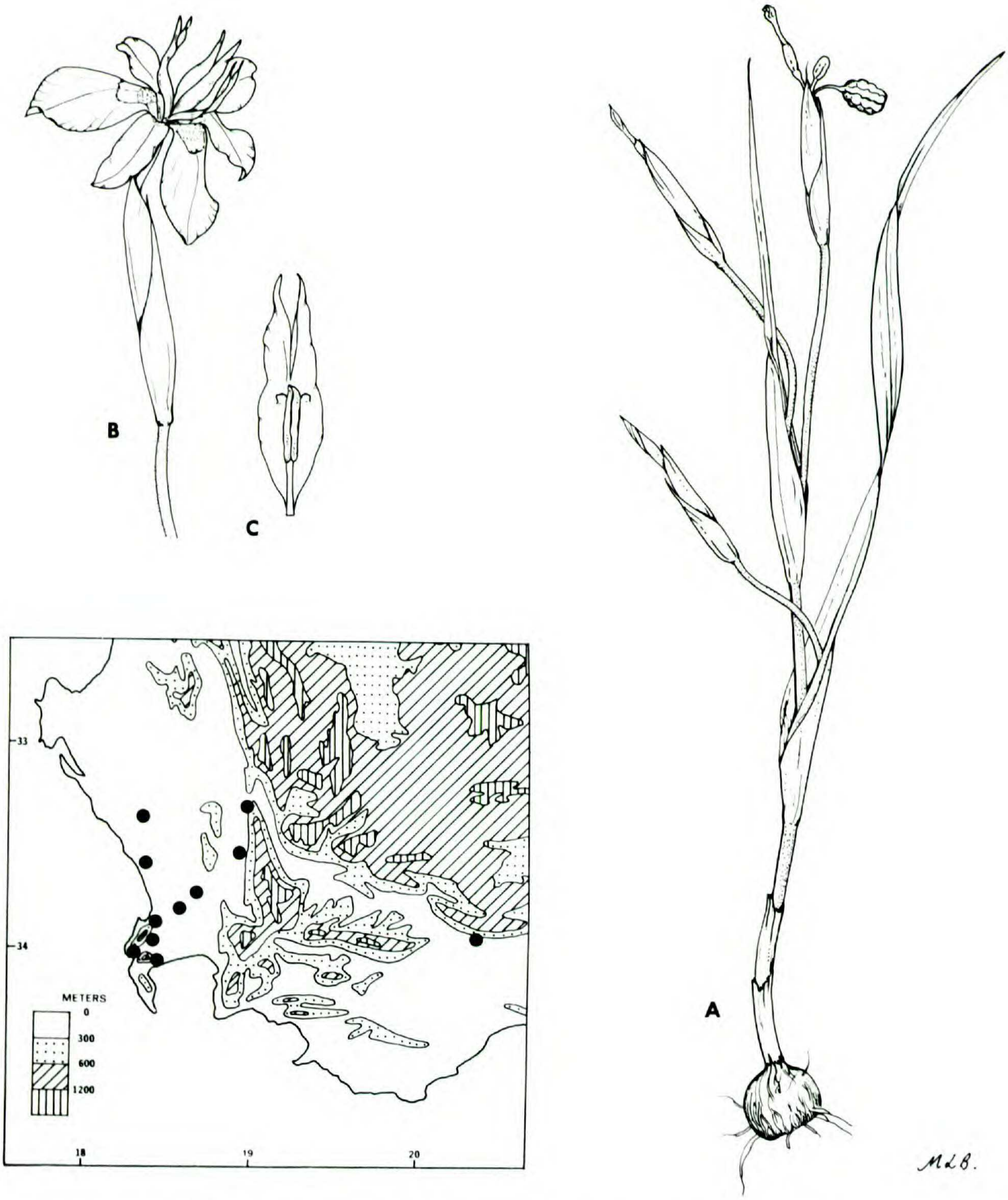

FIGURE 8. Morphology and distribution of *Moraea vegeta*.—A. Habit (×0.3).—B. Flower (life size).—C. Style branch and stamen (×2).

this has been shown to be a nomen nudum (Barnard & Goldblatt, 1975) which cannot be identified. *Moraea vegeta* was first mentioned together with *M. juncea* by Linnaeus in 1762 where short diagnoses with incomplete reference to Miller's *Figures of Plants* were given. Subsequently in 1767, Linnaeus cited Miller's *Figures of Plants*, *Tab. 237*, *fig. 2* in referring to *M. vegeta* but did not elaborate on *M. juncea*, which remains to this day something of a mystery. This relatively simple situation became confused when the eighth edition of Miller's *The Gardeners Dictionary* misapplied *M. vegeta* to the following plate, *Tab. 238*, *fig. 1*, a species already described by Linnaeus as *M. iridioides* (now the type species of *Dietes*), while naming the type illustration of *M. vegeta*, *Tab. 237*, *M. juncea.* Although this error was noted and corrected in subsequent editions, it provided Brown with the idea that the correct name of the type species of *Moraea* might be *M. juncea.* Following Brown's published work on the subject, *M. juncea* was cited as the "conserved type" of *Moraea.* This error, only recently exposed fully (Barnard & Goldblatt, 1975) resulted in the name *M. vegeta* being applied to *Dietes*, as *D. vegeta* (L.) N. E. Brown subsequent to 1928.

Before N. E. Brown's treatment the name *Moraea tristis* (L.f.) Ker was used for *M. vegeta*, even when the earlier synonym was known (Ker, 1803).

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Near Darling (AD), *Lewis Grant & Theiler 4609* (BOL). Mud River turn-off, Darling road, *Goldblatt 307* (BOL). Lions Head, Cape Town (CD), *H. Bolus s.n.* (BOL). Camp Ground, Cape Peninsula, *Wolley Dod 597* (BOL, K). Sherwood, Kenilworth, *H. Bolus s.n.* (BOL). Claremont, Cape Peninsula, *Stokoe s.n.* (SAM-54345). Salt River, Cape Town, *Zeyher 72* (SAM, PRE). Wellington (DB), *Lewis Grant 2307* (BOL, MO). Durbanville (DC), *Barker 820* (NBG). Phesante Kraal, *Compton 16012.* (BOL, NBG).

33.19 (Worcester): Nuwe Kloof (AC), *Schlechter 9018, 2549* (K, PRE).

33.20 (Montagu): Swellendam Mountains (CD), *Marloth 8647* (PRE).

34.18 (Simonstown): Groot Constantia, Cape Peninsula (AB), *Goldblatt 474* (BOL). Constantiaberg, *MacOwan s.n.* (SAM-20576).

4. **Moraea indecora** Goldbl., sp. nov. TYPE: South Africa, Cape, sandy flats, 8 km E of Nababeep, *Goldblatt 3053* (MO, holotype; NBG, PRE, S, isotypes). —FIG. 9.

Planta magna, caule ramosa. *Cormus* ad 3 cm latus, profunde infossus, tunicis fibrosis. *Folia* 3–6, inserta supra terram. *Flores* lutei; tepala exteriora 2.5–4 cm longa, effusa, unguis brevis, ad 5 cm longis; tepala interiora 3–3.5 cm longa, effusa. *Filamenta* ca. 8 mm longa, connata ad base; *antherae* 8–10 mm longa, stigmata excedentes. *Capsula* ca. 1.5 cm longa, subpendula; *semina* orbiculata ad angulata.

Plants large, 35–60 cm high. *Corm* very deep seated, to 25 cm below the surface, ca. 2 cm in diameter; tunics of fine fibers. *Leaves* 3–6, inserted well above ground level, exceeding the inflorescence, ca. 1 cm wide, canaliculate. *Stem* leafless for 10–15 cm above ground, much branched. *Spathes* herbaceous below, dry above, with dark brown apices; inner spathes 4–5 cm long, the outer about 3–4 cm. *Flower* large, yellow; outer tepals 2.5–4 cm long, lanceolate, spreading, the claw short, ca. 5 mm long; inner tepals 2.2–3.5 cm long, also spreading. *Filaments* ca. 8 mm long, joined only near the base; *anthers* 8–10 mm long, exceeding the stigma, the pollen bright red. *Style* ca. 1.2 cm long, the crests 7–15 mm long. *Capsules* 1.5 cm long, 8 mm wide, showing impression of the seeds, subpendulous. Chromosome number $2n = 16$ (*Goldblatt 3053*, type collection).

Flowering time: October.

Distribution: Deep sandy soil, in central Namaqland around Springbok.—FIG. 9.

Moraea indecora was only recently discovered while I was studying *Moraea* in Namaqualand in the spring of 1974. During mid-October, after a season of particularly good, though late rains, this species was found at two sites, one north of Springbok near Nababeep and the other west of Springbok on the road

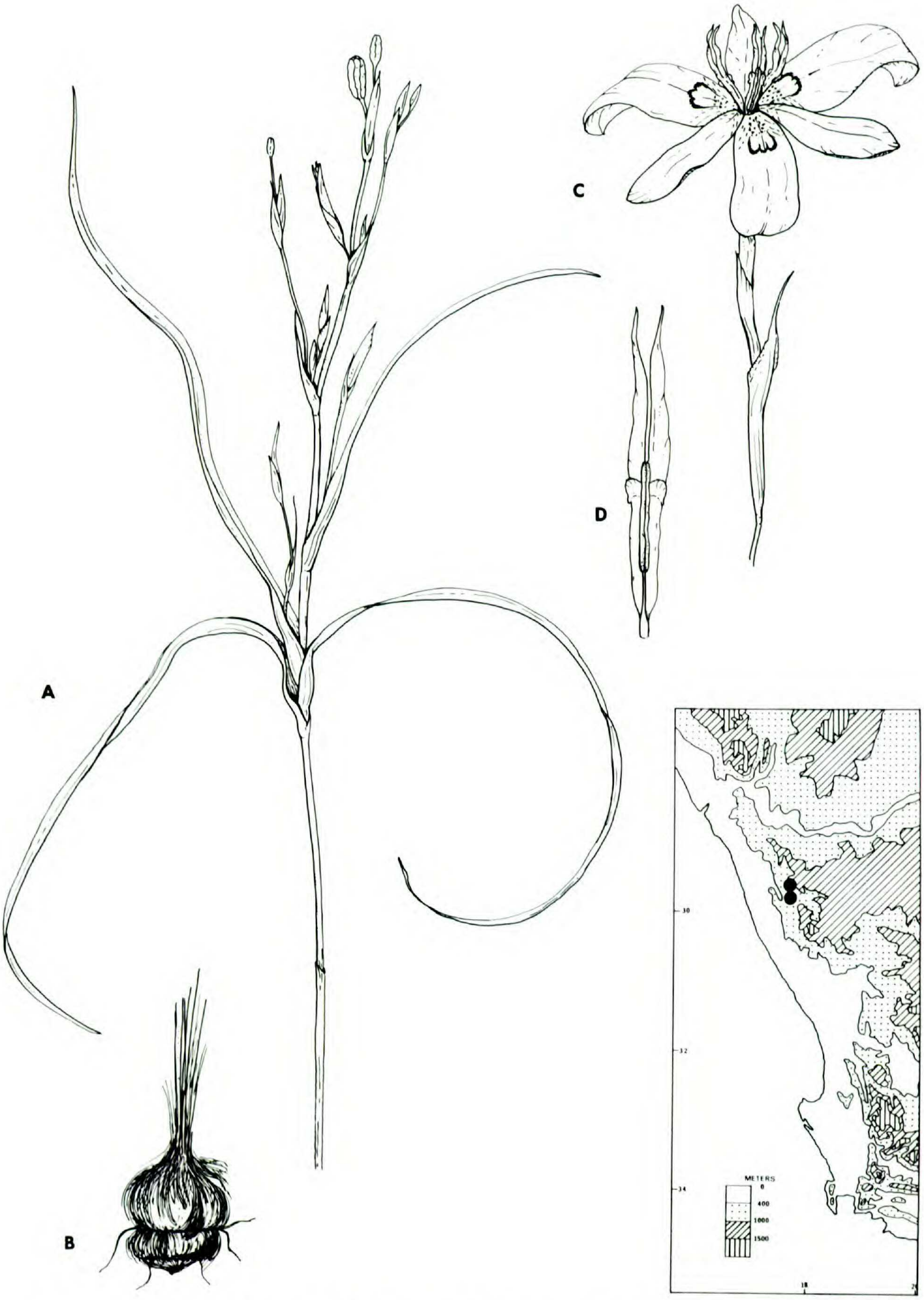

FIGURE 9. Morphology and distribution of *Moraea indecora*.—A. Habit (× 0.25).—B. Corm (× 0.5).—C. Flower (life size).—D. Style branch and stamen (× 1.5).

to Spektakelberg. It grows in the typical coarse, granite-derived sand of Namaqualand, in level, open areas and was found together with the recently described *M. margaretae*, a similar though much smaller species. The two may perhaps be confused, although size alone distinguishes them. *Moraea indecora* is peculiar in having the lowermost leaves inserted well above the ground, just below the first branch. This, together with the large yellow flowers, bright red anthers which extend beyond the stigmas, and subpendulous capsules leave no doubt about the validity of this species. The large corms of *M. indecora* are particularly deep seated, being at least 20 cm below the surface, partly wedged in bed rock.

This species clearly belongs in section *Moraea* and is probably most closely related to *M. vegeta* and perhaps *M. margaretae*. It shares with the former a similar subpendulous capsule and rather fibrous corm tunics. Though similar in general appearance to *M. margaretae*, it differs in several aspects such as branching and flower structure, as well as overall size.

The chromosome number of $n = 8$ in *Moraea indecora*, reported here for the first time, is unusual in subgenus *Moraea* where $n = 10$ predominates and only a few aneuploid species are known, such as *M. papilionacea* and *M. tricolor* ($n = 9$) and *M. fugax* ($n = 8$ and 6). In spite of its lower chromosome number, there is good reason for including *M. indecora* in section *Moraea* where its many leaves and branched habit are quite consistent with the general morphological pattern.

SOUTH AFRICA. CAPE: 29.17 (Springbok): Sandy flats, 8 km E of Nababeep (DB), *Goldblatt 3053* (MO, NBG, PRE), *3062* (MO, NBG). W of Springbok on road to Spektakelberg, *Goldblatt 3060* (K, MO, NBG, PRE).

5. **Moraea fergusoniae** L. Bol., S. African Gard. 19: 294. 1929. TYPE: South Africa, Cape, Riversdale, *Ferguson s.n.* (BOL-18970, holotype).—FIG. 10A–B.

M. fimbriata Klatt, Linnaea 34: 561. 1866; Baker, Fl. Cap. 6: 13. 1896, nom. illeg., non Loisel., 1822. TYPE: South Africa, Cape, Caledon, *Ecklon & Zeyher Irid. no. 42* (SAM, lectotype).

Plants 10–20 cm high, simple or usually 2–4-branched from the base. *Corm* 5–15 mm in diameter; tunics of pale medium fibers. *Leaves* 3–6, to 1 cm wide, seldom exceeding 10 cm long, dark green, usually glabrous, falcate or loosely coiled, the margins ciliate, undulate to crisped. *Stem* terete, glabrous, consisting of a few short internodes near the ground and 1 long upper internode, branching only near ground level. *Spathes* herbaceous with brown, attenuate apices; inner spathe 2.6–3.8 cm long, the outer ca. half the inner. Flowers white to cream, rarely blue with a yellow nectar guide; outer tepals to 2 cm long, lanceolate, the limb ca. 1.1 cm long; inner tepals erect, 8–12 mm long, entire and narrowly lanceolate or with a long central cusp and 2 small lateral lobes near the midline. *Filaments* to 4 mm long, entirely united or free for the upper 1 mm; *anthers* 3 mm long, yellow. *Style branches* 3–5 mm long, the crests linear, 5–7 mm long. *Capsule* ca. 7 mm long, clavate; seeds angled. Chromosome number $2n = 20$.

Flowering time: Late July and August.

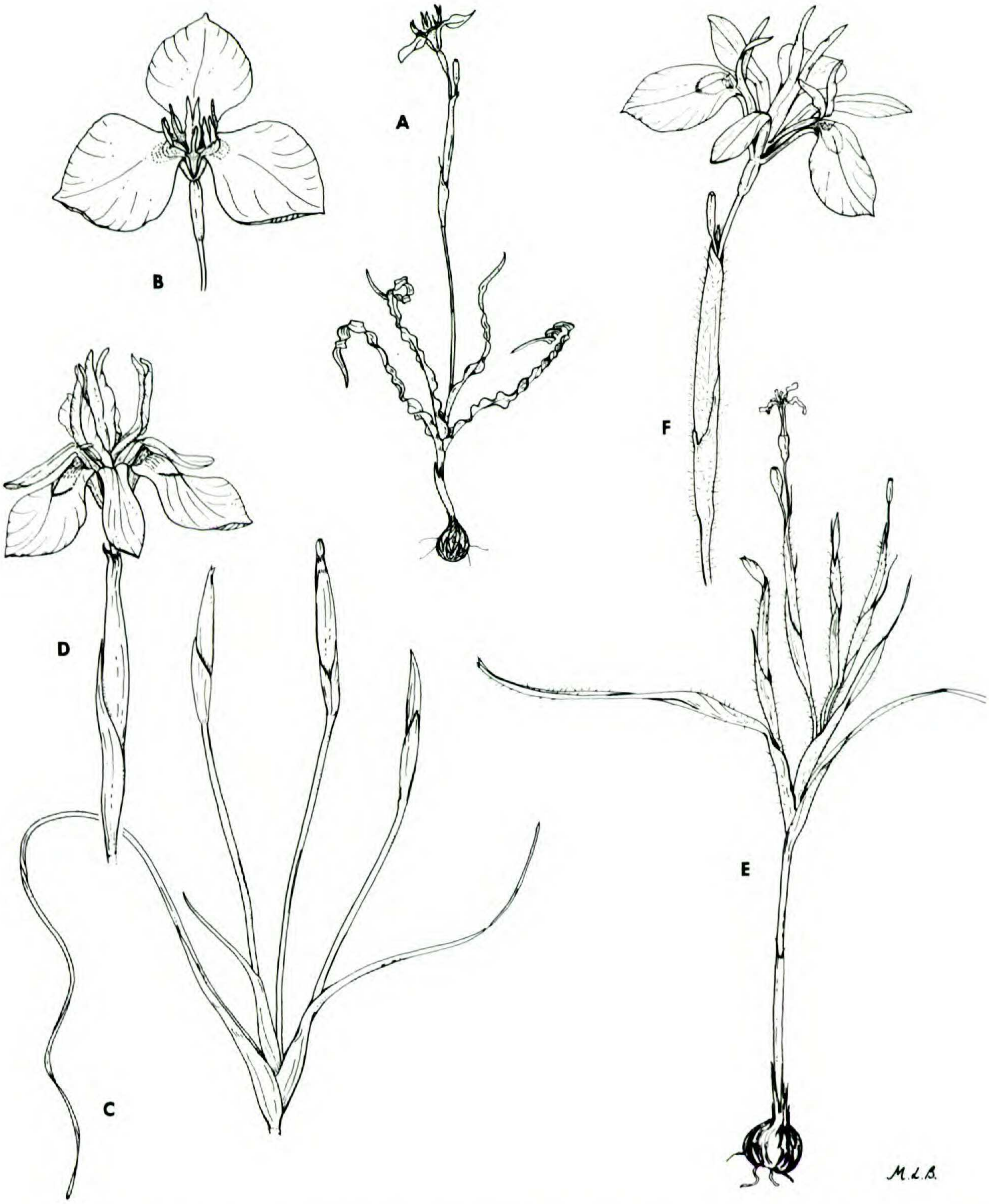

FIGURE 10. *Moraea* species.—A–B. *Moraea fergusoniae*.—A. Habit (×0.5).—B. Flower (life size).—C–D. *M. margaretae*.—C. Habit (×0.75).—D. Flower (life size).—E–F. *M. papilionacea*.—E. Habit (×0.75).—F. Flower (life size).

Distribution: Clay slopes and flats from the Caledon district eastwards to Robinson Pass near Mossel Bay.—FIG. 11.

Moraea fergusoniae is very closely allied to *M. papilionacea* from which it is best distinguished by its white to ivory or blue flower that sometimes has tricuspidate inner tepals, a glabrous stem, and twisted leaves with undulate to crisped margins. It occurs on clay flats and slopes in the southern Cape between Botrivier in the Caledon district and the Langeberg foothills near Mossel Bay.

Though originally described as *M. fimbriata* by Klatt from an Ecklon and Zeyher collection from Caledon, this epithet, unfortunately a homonym of *M. fimbriata* Loisel (a synonym for *Iris cristata* Soland.), must be rejected. The correct name for this species, *M. fergusoniae*, was provided by Louisa Bolus who was apparently unaware that this was conspecific with Klatt's species.

SOUTH AFRICA. CAPE: 33.22 (Oudtshoorn): Robinson Pass (CC), *Hiemstra s.n.* (MO). 34.19 (Caledon): Slopes north of Botrivier (AA), *Bolus 9926* (BOL, K). Caledon Baths (AB), *Guthrie 2520* (BOL, NBG). Near Caledon, *Ecklon & Zeyher s.n.* (PRE, MO, SAM), *Ecklon & Zeyher Irid. no. 42* (SAM); *Stayner s.n.* (NBG-88048). Kleinriviersberge (AD), *Ecklon & Zeyher 4091* (C, K, PRE, S). Genadendal (BA), *Pappe s.n.* (K). Fairfield (BD), *Barnard s.n.* (SAM-68453).

34.20 (Bredasdorp): Bontebok Park, Bredasdorp (CA), *Acocks 22519* (PRE). The Poort, Bredasdorp, *Barker 2524* (BOL, NBG).

34.21 (Riversdale): Riversdale (AB), *Ferguson s.n.* (BOL-18970); *Muir 4874* (K).

6. **Moraea papilionacea** (L.f.) Ker, Bot. Mag. *tab. 750.* 1804; Baker, Fl. Cap. 6: 12. 1896.—FIG. 10E–F.

Iris papilionacea L.f., Suppl. Pl. 98. 1781. TYPE: South Africa, Cape, hills near Cape Town, *Thunberg s.n.* (Herb. Thunberg 1145, UPS, lectotype).
Moraea pilosa Wendl., Bot. Beob. 42. 1798. TYPE: unknown.
Iris hirsuta Licht. ex R. & S., Syst. Veg. 1: 478. 1817. TYPE: unknown, collected in the Tulbagh district.
Moraea hirsuta (Licht. ex R. & S.) Ker, Irid. Gen. 43. 1827.
Vieusseuxia intermedia Eckl., Top. Verz. 12. 1827, nom. nud.
V. nervosa Eckl., Top. Verz. 12. 1827, nom. nud.
Moraea papilionacea var. *maythamiae* Lewis, J. S. African Bot. 37. 1949. TYPE: South Africa, Cape, Rondebosch Common, *Salter 8989* (SAM, lectotype; BOL, NBG, isolectotypes).

Plants 10–15 cm high, simple to 5-branched. *Corm* 5–15 mm in diameter; tunics brown to black, the fibers medium to coarse. *Leaves* 2–4, linear, to 7 mm wide, occasionally exceeding the inflorescence, falcate, lightly pubescent on the abaxial surface, occasionally glabrous, the margins sparsely ciliate. *Stem* terete, lightly puberulous to villous, 1–2 internodes long, branching at the base or from the upper node. *Spathes* herbaceous, often with dry brown apices, pubescent or occasionally glabrous; inner spathe 3–6 cm long, the outer ⅓–⅔ the length of the inner. *Flowers* few per spathe, yellow or salmon colored, the nectar guides outlined in green or red, sweetly scented; outer tepals ca. 2.5 cm long, to 5 mm wide, outspread. *Filaments* 3–6 mm long, united at the base only; *anthers* ca. 4 mm long, the pollen red. *Style branches* to 8 mm, the crests lanceolate, 1–1.5 cm long. *Capsule* broadly ovate, 7–8 mm long, ca. 5 mm wide; *seeds* angular. Chromosome number $2n = 18$.

Flowering time: August to October.

Distribution: Flats and slopes; in clay or sand, usually poorly drained areas, from the Cedarberg in the north to the Caledon district.—FIG. 11.

Moraea papilionacea is readily distinguished from its allies by its brick red to yellow flower, pubescent stem, and leaf which is either villous on the margins and veins or at least ciliate on the margins. Its closest relative, *M. fergusoniae*, with white to blue flowers, has a glabrous stem though the leaves have ciliate margins; *M. margaretae*, also closely related, has glabrous stems and leaves which have minutely ciliate leaf margins; *M. vegeta*, a more distant ally, has a puberulous stem but smooth leaf margins. *Moraea papilionacea* appears to be replaced from the Caledon district eastwards by *M. fergusoniae*. Though both occupy a similar habitat, growing in clay soil amongst low ericoid shrubs, and both occur in the Caledon district, they have not been reported growing together. *Moraea papilionacea* with $n = 9$ is clearly an aneuploid species, this number being derived from the basic $x = 10$ in subgenus *Moraea*.

Two species, *Moraea pilosa* and *M. hirsuta* are included in the synonymy; these are known only from description and the types are evidently lost. The identities of the two Ecklon nomina nuda included in the synonymy are known from annotations on Ecklon and Zeyher collections at the Riksmuseum at Stockholm, and elsewhere.

Moraea papilionacea has a somewhat limited range, from the central Cedarberg, above Algeria where a dwarf form occurs, south to the Caledon district. It is variable and four forms can be distinguished. The commonest and best known is the large salmon or yellow form found on clay flats and slopes between the Cape Peninsula and the Tulbagh area; east of the Hottentots Holland and Kogelberg ranges, near Caledon and Hermanus, clear yellow, glabrous-leafed plants are found; while to the north of the Tulbagh area in the Cedarberg and Cold Bokkeveld ranges a very diminutive slender-leafed form is found on sandy soils. A last form, found on sandy soils in the Cape Peninsula and surrounding Cape Flats, was given varietal rank by G. J. Lewis as var. *maythamiae*; this has a slender leaf, is almost glabrous, and, according to Lewis, blooms in late afternoon, whereas other forms flower from midmorning. The variety is not recognized as plants intermediate between it and the commoner typical variety are known. Also, since none of the other recognizable forms of *M. papilionacea* are accorded taxonomic status, it would be inconsistent to accept var. *maythamiae*.

SOUTH AFRICA. CAPE: 32.19 (Wuppertal): Elandskloof (CA), *Lewis s.n.* (BOL). Warm Baths, Olifants River valley, *Edward s.n.* (BOL-14436).

33.18 (Cape Town): Basons farm, Darling (AD), *Barker 6766* (NBG). Darling road, Ganzekraal turnoff, *Barker 719* (NBG). Near Darling, *Bolus 12831* (BOL, BR, PRE). Lower slopes, Devils Peak (CD), *Wolley Dod 596* (BOL); *Ecklon 818* (K, PRE); *Froembling s.n.* (NBG); *Treleaven 98* (SAM). Camp Ground, Cape Peninsula, *Ecklon & Zeyher 5021* (SAM). *Salter 8989* (NBG), *9643* (BOL, PRE, SAM). Cape Town, *Marloth 193* (PRE); *Prior s.n.* (PRE). Dal Josafat (DA), *Middlemost s.n.* (NBG-58644); *Lewis Grant 2347* (BOL, BR, K, M, MO); Near Durbanville (DC), *Esterhuysen 17505* (BOL, PRE). Bottelary road, Stellenbosch (DD), *Lewis 2228, 2229* (both SAM). Jonkershoek valley, *Lewis 1652* (SAM).

33.19 (Worcester): Near Tulbagh Road Station (AC), *Goldblatt 193* (BOL). Between Bains Kloof and Wolseley, *Goldblatt 2430* (MO). Prince Alfreds Hamlet (AD), *Walgate 384* (NBG). Gydo, *Leipoldt 4080* (BOL). Bothas Halt (CA), *Gillet 243* (BOL).

34.18 (Simonstown): Steenberg, Cape Peninsula (AB), *Compton 13640* (NBG). Kloof Nek (Hout Bay Nek), *Schlechter 1310* (K, S, SAM); *Goldblatt 445* (BOL); *Pillans 10690* (MO). Faure (BA), *Strey 558* (PRE); *Compton 16242* (NBG). Flats between Gordon's Bay and Strand, *Esterhuysen 23129* (BOL).

34.19 (Caledon): Elgin (AA), *Dahlstrand 1182* (PRE). Caledon commonage (AB), *Barker 118* (BOL, K). Zwartberg, *Ecklon & Zeyher s.n.* (PRE-22396, S). Vogelklip, Hermanus (AD), *Barker 1787* (NBG). Between Caledon and Shaws Pass, *Goldblatt 301* (BOL).

Without precise locality: Near Ceres, *Marloth 147, 12994* (both PRE). Cedarberg, *Thode A2075* (PRE). Cape of Good Hope, *Sparrman s.n.* (S); *Thunberg s.n.* (S).

7. **Moraea margaretae** Goldbl., Ann. Missouri Bot. Gard. 63: 19. 1976. TYPE: South Africa, Cape, Namaqualand, pipeline track, SW of Nababeep, *Goldblatt 628* (BOL, holotype; K, MO, PRE, S, isotypes).—FIG. 10C–D.

Plants to 15 cm high, usually 1–2-branched. *Corm* 5–7 mm in diameter; tunics brown, coarsely fibrous, the inner layers entire. *Leaves* 2–3, linear, canaliculate, often terete and twisted near the apex. *Stem* glabrous, usually branching from the base. *Spathes* herbaceous, with dark brown, acute or lacerated apices; inner spathe 3–4.5 cm long, the outer 2–3 cm long. *Flowers* few, pale yellow; outer tepals 2–3 cm long, the limb 1.5–2 cm long, spreading to reflexed; inner tepals erect, spreading later, lanceolate, obtuse, to 2.0 cm long. *Filaments* ca. 5 mm long, joined for 4 mm; *anthers* 4–5 mm, red. *Style branches* ca. 7 mm long, the lanceolate crests 6–10 mm long. *Capsule* and *seeds* unknown. Chromosome number $2n = 40$.

Flowering time: Late September and October.

Distribution: Coarse sandy soils in Namaqualand.—FIG. 11.

Moraea margaretae is closely related to *M. papilionacea*, a common southwestern Cape species. The two can readily be distinguished by the stem which is lightly villous in *M. papilionacea* but entirely glabrous in *M. margaretae*. The flower and habit of *M. margaretae* is similar to the newly discovered *M. indecora*, but the two differ in several details (see discussion under *M. indecora*).

Though rather poorly collected, I have found *M. margaretae* to be quite common from Garies north to Springbok. It grows in sandy soils, in both hilly and flat places. It is rather late flowering, usually after the end of the flowering period of most Namaqualand plants, and this may explain why it is so rarely collected. *Moraea margaretae* is evidently a polyploid species, with two reports of $2n = 40$, the only recorded polyploid in section *Moraea*.

SOUTH AFRICA. CAPE: 29.17 (Springbok): 4 km W of Steinkopf (BA), *Goldblatt 2775* (MO). Koufontein, Steinkopf district (BC), *Herre s.n.* (STE-11835). Pipeline road S of Nababeep (CA), *Goldblatt 628* (BOL, K, MO, PRE, S). 8 km E of Nababeep (CB), *Goldblatt 3061* (NBG, MO, PRE).

30.17 (Hondeklipbaai): 8 km N of Garies (BD), *Leighton 1129* (BOL). Brackdam, hills, *Schlechter 11120* (BM).

Without precise locality: Namaqualand minor, *Scully 134* (BM).

8. **Moraea serpentina** Baker, Handbook Irid. 52. 1892. TYPE: South Africa, Cape, Okiep, stony places, *Bolus 6572* (K, lectotype; GRA, isolectotype). Little Namaqualand, *Bolus 6571* (BOL, K syntypes); Ezelskop-Roodeberg, Khamiesberg, *Drège 2599* (K, S, syntypes).—FIG. 12A–B.

M. arenaria Baker, Handbook Irid. 52. 1892. TYPE: South Africa, Cape, sandhills, Ebenezer, *Drège 8324* (K, holotype; S, isotype).

M. framesii L. Bolus, S. African Gard. 17: 418. 1927. TYPE: South Africa, Cape, near Calvinia, *Ross Frames s.n.* (BOL, holotype).

Plants 4–20 cm high, usually branched. *Corm* 8–20 mm in diameter, asymmetric at the base; tunics of tough coarse, usually dark fibers. *Leaves* basal only, or occasionally cauline, (1–)3(–5), rarely solitary, canaliculate or ± flat, undulate-flexuose, glabrous or lightly pubescent on the margins or on the abaxial surface. *Stem* 2–3 internodes long, branching from the base or the upper nodes. *Spathes*

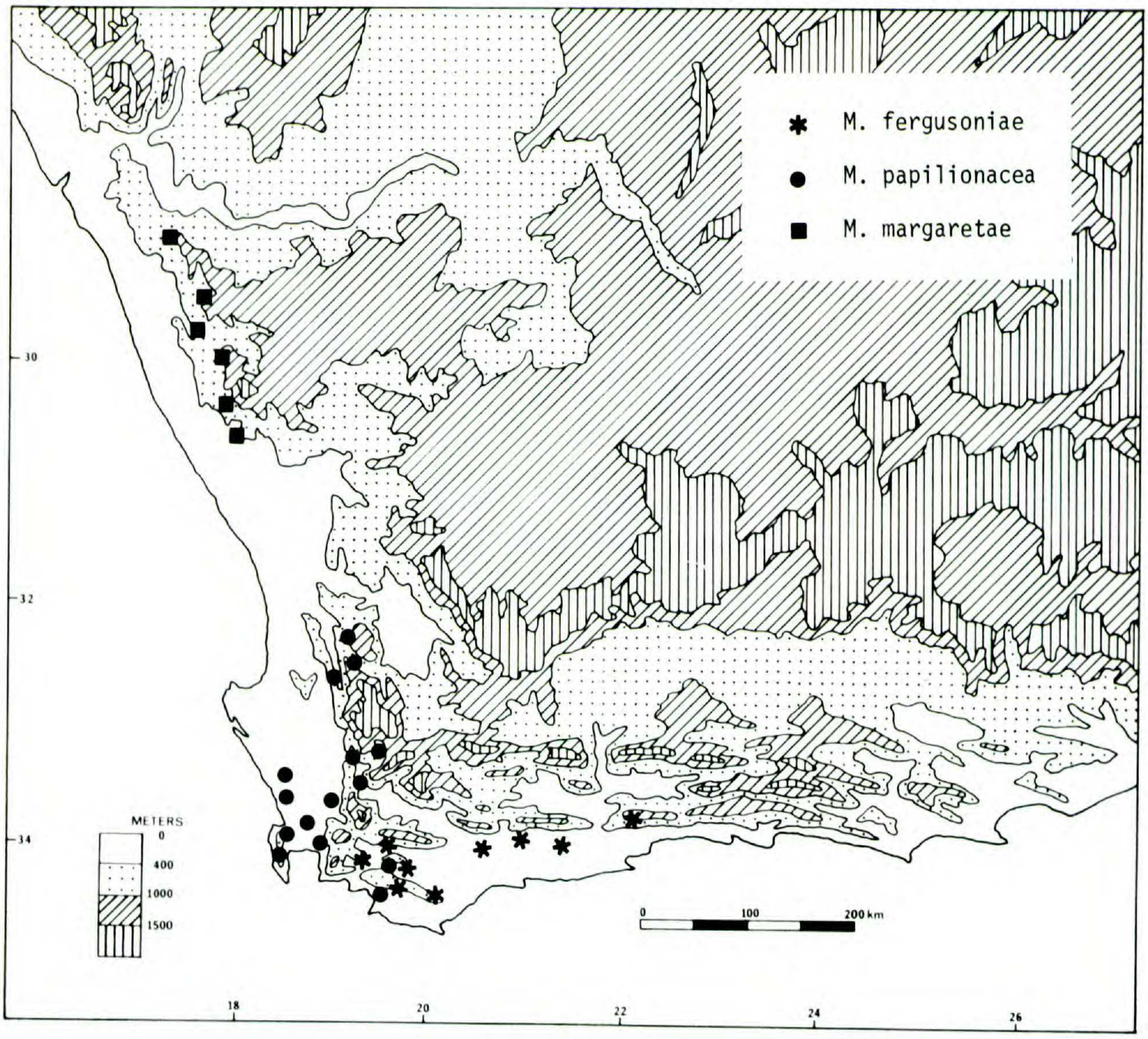

FIGURE 11. Distribution of *Moraea fergusoniae*, *M. papilionacea*, and *M. margaretae*.

usually dry, membranous, the apices entire, attenuate, or often lacerated; inner spathe 1.5–3 cm long, the outer ± half the inner. *Flowers* few per spathe, white to yellow, sometimes flushed with mauve or pink, the nectar guides large and yellow; outer tepals 2.4–3.0 cm long, the claw to 1 cm long, the limb 1.5–2.5 cm wide, obtuse-retuse; inner tepals 2–3 cm long, erect, broadest near the apex. *Filaments* 5–7 mm long, joined near the base only or to midline; *anthers* 3–5 mm long. *Style branches* ca. 6 mm long, the crests 4–8 mm, lanceolate. *Capsule* enclosed in the spathes, clavate, ca. 1 cm long; *seeds* angled. Chromosome number $2n = 20$.

Flowering time: September to October.

Distribution: Sandy to gravelly places, extending along the west coast from Klawer in the south to the Richtersveld in the north, also occurring in Bushmanland and the Karoo.—FIG. 13.

When Baker (1892) described *Moraea serpentina* and *M. arenaria*, here treated as conspecific, he distinguished them by their leaves. While both had more or less twisted, coiled leaves, *M. serpentina* was described as having a pilose,

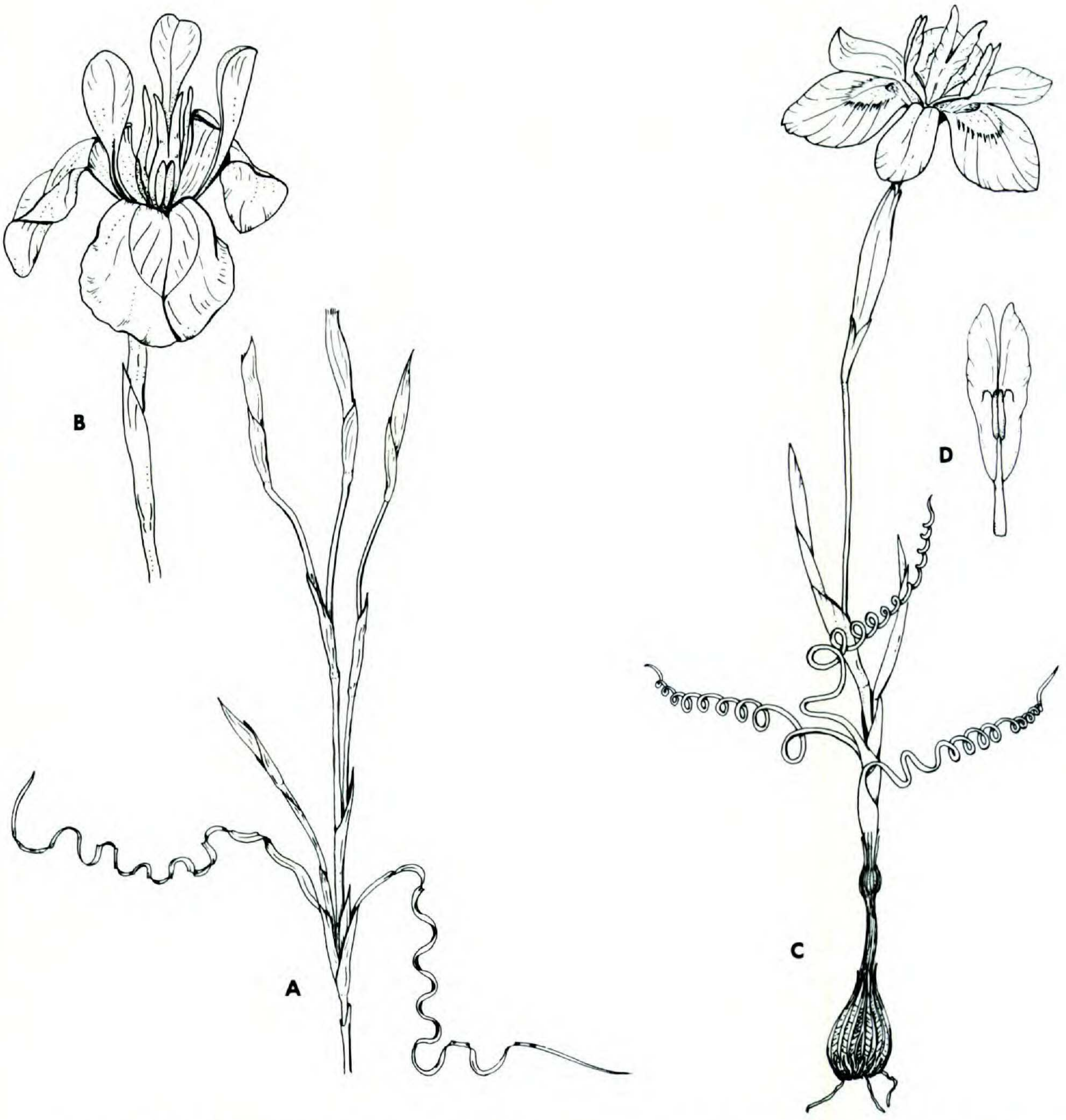

FIGURE 12. *Moraea* species.—A–B. *M. serpentina*.—A. Habit (×0.75).—B. Flower (life size).—C–D. *M. tortilis*.—C. Whole plant (×0.75).—D. Style branch and stamen (×1.5).

very flexuose, linear leaf, and *M. arenaria* as having a spirally twisted, glabrous, ± terete leaf. Examination of type material, however, reveals that *M. arenaria* does not have a truly terete leaf, rather it is of the same type as *M. serpentina*, only narrower but distinctly bifacial and channeled. It is glabrous, but this is a poor distinguishing character, for among the three collections of *M. serpentina* cited by Baker, only one, *Drège 2599*, from the Khamiesberg is clearly pilose. In fact, examination of many wild populations of this species from Namaqualand reveals that the pilose leaf occurs occasionally in several areas in forms with a bifacial leaf. It is commonest in the Khamiesberg but is also found near Okiep and Steinkopf. When the variation in leaf form is taken into account, *M. serpentina* and *M. arenaria* cannot be regarded as separate species.

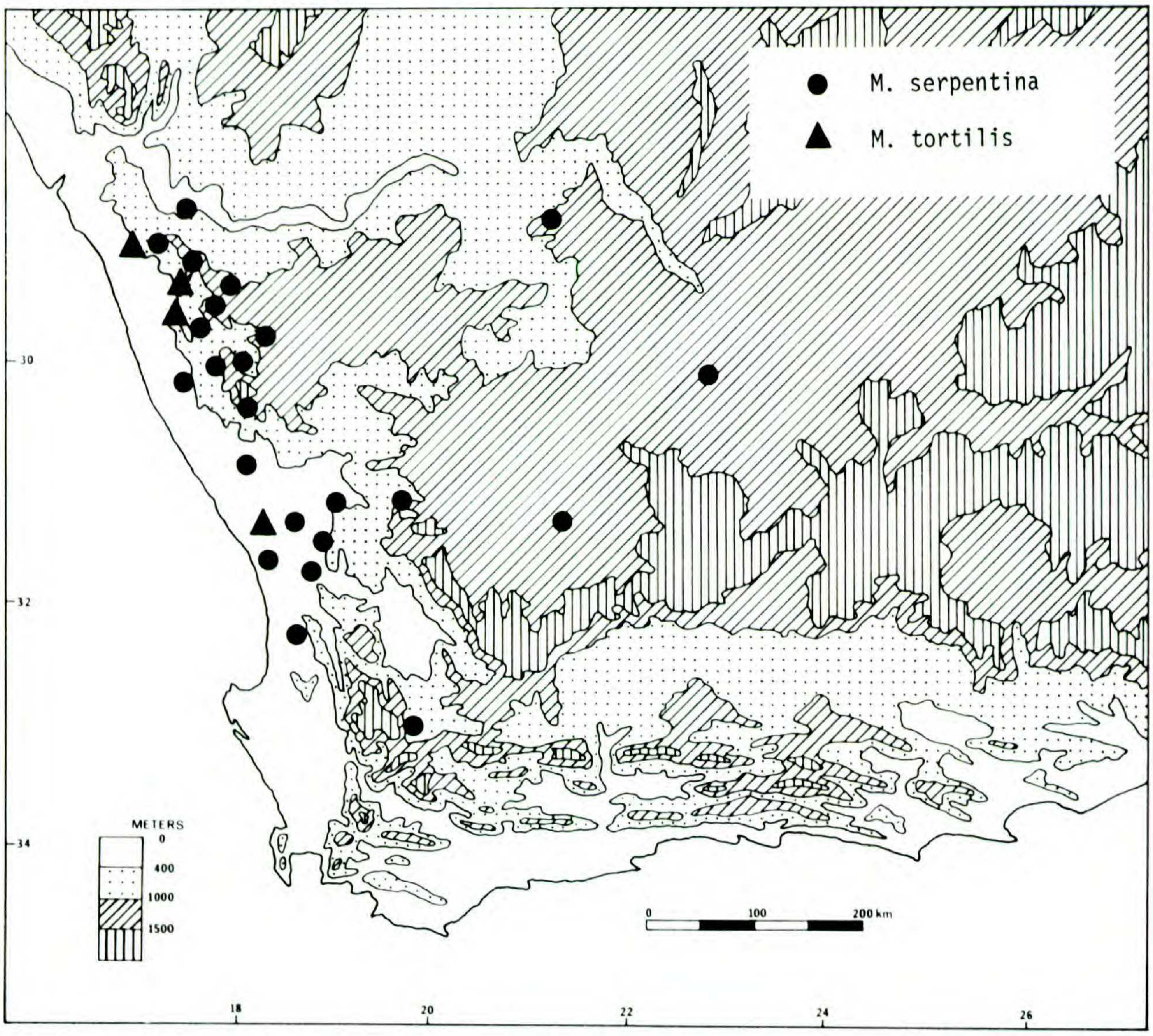

FIGURE 13. Distribution of *Moraea serpentina* and *M. tortilis*.

Moraea framesii, clearly simply a glabrous-leafed form of *M. serpentina* with a broader than typical leaf, is also included in synonymy here.

Moraea serpentina, especially under its synonym *M. arenaria*, has often been associated with a second species described in this paper, *M. tortilis*, which has a truly terete, spirally coiled leaf. Vegetatively the species are similar, except for the quite terete leaf, and may occasionally be confused. The flowers are, however, quite distinct. *M. serpentina* has a white flower often flushed purple or pink, with large nectar guides and erect inner tepals, while *M. tortilis* has white to dark blue flowers with smaller nectar guides and broad reflexed inner tepals. These very significant floral differences are often quite obscured in dried material so that the leaf must be used for distinguishing these two taxa.

Moraea serpentina is very common in dry areas of the Van Rynsdorp district and extends north to Springbok. It usually blooms quite late, in October, but has been collected in flower from the end of August. The handful of records to the east of Namaqualand in Bushmanland and the Karoo may indicate a scattered distribution here, but it is equally likely that these areas are simply rather poorly collected.

SOUTH AFRICA. CAPE: 28.17 (Vioolsdrif): Stinkfontein (CD), *Schlechter 11091* (BOL, BR, GRA, K, PRE, S).

28.21 (Upington): Klipkoppies, between Upington and Kenhardt (CD), *Lewis 249* (SAM).

29.17 (Springbok): Ca. 10 km W of Steinkopf (BA), *Strauss 139* (NBG). Anenous flats, *Marloth 12215* (BOL, PRE). Near Springbok (DB), *Lewis 740, 741* (SAM). Near Okiep, *H. Bolus 6572* (BOL, K); *O'Connor Fenton s.n.* (BOL). Near Concordia, *L. Bolus s.n.* (BOL); *Lewis 5533* (NBG). Hills E of Nababeep, *Goldblatt 630* (BOL); *Goldblatt 3051* (MO, PRE). Mesklip (DD), *Compton 5419* (BOL); *Schlechter 11284* (BR, K, MO, S). Ca. 18 km SW of Springbok, *Acocks 19570* (K, NBG, M, PRE). Droedap, *Esterhuysen 5892* (BOL, K, PRE); *Compton 11443* (NBG).

29.18 (Gamoep): 40 km E of Springbok (CA), *Salter 3789* (BOL).

30.17 (Hondeklipbaai): Soebatsfontein (BA), *Barker 6700* (NBG). Between Buffels River and Soebatsfontein, *Leighton 1210* (BOL); *Lewis 1634* (SAM).

30.18 (Khamiesberg): Between Roodeberg and Ezelskop (AC), *Drège 2599* (K, S). Khoms Ravine, *Pearson 6651* (BOL, K). Foot of Studers Pass, *Goldblatt 634* (BOL). Khamiesberg, *Compton 13222* (NBG). 10 km NNW of Bitterfontein (CC), *Acocks 19507* (K, NBG).

30.23 (Britstown): Smartts Syndicate between Prieska and Britstown (CB), *Marloth s.n.* (BOL).

31.18 (Van Rhynsdorp): Near Bitterfontein (AA), *Lewis Grant 4776* (MO). Knechtsvlakte (BC), *Pillans 6336* (BOL, K). Ebenezer, sandhills (CA), *Drège 8324* (K). Van Rhynsdorp (DA), *Barker 5876* (NBG). Wiedouw River, *Lewis 2324* (SAM); *Goldblatt 3075A* (MO).

31.19 (Calvinia): Near Blaaukrans, 55 km NW of Calvinia (AB), *Lewis 2753* (SAM). Kliprand turnoff, Nieuwoudtville-Loeriesfontein road (AC), *Goldblatt 578* (BOL). Brandkop, between Nieuwoudtville and Loeriesfontein, *Stokoe s.n.* (SAM-55646). Foot of Van Rhyns Pass, *L. Bolus s.n.* (BOL-19359, BM, K); *Goldblatt 270* (BOL); *Loubser 950* (NBG); *Hall 3361* (NBG).

31.20 (Williston): 25 km W of Williston, arid karoo (BD), *Acocks 17709* (K, M, NBG, PRE).

32.18 (Clanwilliam): Graafwater (BA), *Zinn s.n.* (SAM-59815).

33.19 (Worcester): Karoo Poort (BB), *Herre s.n.* (BOL).

9. **Moraea tortilis** Goldbl., sp. nov. TYPE: South Africa, Cape, quartzite slopes between Okiep and Steinkopf, *Goldblatt 2771* (MO, holotype; K, NBG, PRE, isotypes).—FIG. 12 C–D.

Planta 10–15 cm alta, saepe pauciramosa. *Tunicae* cormis atrobrunneae fibris crassis. *Folia* (1–)–3, teretia, glabra, helicoidea. *Flores* coerulei ad albi; tepala omnia reflexa ad 45°; tepala exteriora 2.5–3.5 cm longa; tepala interiora breviora. *Capsula* clavata, ad 1.3 cm longa; *semina* parva, angulata.

Plants 10–15 cm high, usually branched. *Corm* ca. 10 mm diameter, assymmetric at the base; tunics of tough, dark fibers. *Leaves* basal and sometimes cauline, (1–)2–3, terete (becoming flattened adaxially when dry) and coiled helically like a corkscrew, glabrous. *Stem* 2–3 internodes long, branching from the base and upper nodes. *Spathes* herbaceous below, becoming completely dry and lacerated; inner spathe 2.5–4 cm long, the outer ± half the inner. *Flowers* blue to white with a small yellow nectar guide; outer tepals 2.5–3.5 cm long, the claw to 1.4 cm long, the limb ca. 2 cm wide, obtuse-retuse; inner tepals to 3 cm long, reflexed to 45°. *Filaments* 8 mm long, joined in the lower half; *anthers* 5 mm long. *Style branches* to 1 cm long, the crests narrow, ca. 1 cm. *Capsule* clavate-oblong, to 1.3 cm long; *seeds* angled. Chromosome number $2n = 20$ (*Goldblatt 2771*, type collection).

Flowering time: September to October.

Distribution: Sandy to stony places, frequently associated with quartzite, occurring locally along the west coast from Klawer to Steinkopf, Namaqualand.—FIG. 13.

This beautiful species has been known for many years and though collected occasionally, it was associated with *Moraea arenaria* Baker. It has become clear through the examination of living plants that *M. serpentina* and *M. arenaria* are conspecific with *M. framesii*, and the allied *M. tortilis* is distinct.

Moraea tortilis is closely related to *M. serpentina*, but when fresh flowers are examined the differences become very obvious. The blue or white flowers of *M. tortilis* have reflexed inner tepals and small nectar guides in marked contrast to the flowers of *M. serpentina* which have large yellow nectar guides and invariably erect inner tepals. The vegetative aspect of the two species is similar, but the leaves of *M. tortilis* are terete when fresh and coiled like a corkscrew, while those of *M. serpentina* are channeled or flat, though often very narrow, and are usually laxly undulate and twisted, though sometimes coiled as in *M. tortilis*.

Moraea tortilis and *M. serpentina* grow in the same general area of the Cape west coast from the Van Rhynsdorp district north to Steinkopf in Namaqualand, but *M. tortilis* is much rarer and more limited in its range. Their habitats are similar, but *M. tortilis* is often associated with local quartzite patches.

SOUTH AFRICA. CAPE: 29.17 (Springbok): Flats at Anenous (BA), *Marloth 12215* (STE). Steyerkraal, between Ratelpoort and Okiep (BD), *Lewis 5516* (NBG, STE). Quartzite outcrop between Okiep and Steinkopf, *Goldblatt 2771* (MO, NBG, PRE, S), *3040* (MO, NBG, PRE, S). Pipeline road SW of Nababeep (DB), *Goldblatt 3049* (MO, PRE).

Without precise locality: Namaqualand, *Marloth 6984* (PRE).

10. **Moraea lugubris** (Salisb.) Goldbl., Ann. Missouri Bot. Gard. 63: 18. 1976.—FIG. 14.

Ferraria lugubris Salisb., Prodr. Stirp. 42. 1796, nom. nov. pro. *Iris plumaria* Thunb.
Moraea iriopetala L.f., Suppl. Pl. 100. 1781, as to plant intended, not to name; Baker, Fl. Cap. 6: 17. 1896.
Iris plumaria Thunb., Diss. Irid. no. 16. 1782, nom. illeg. TYPE: South Africa, below Devils Peak, near Cape Town, *Thunberg s.n.* (Herb. Thunb. 1153, UPS, lectotype).
Moraea plumaria (Thunb.) Ker, Ann. Bot. (König & Sims) 1: 240. 1805.
Vieusseuxia geniculata Eckl., Top. Verz. 12. 1827, nom. nud.
Moraea mira Klatt, Trans. S. African Philos. Soc. 3: 202. 1885; Baker, Fl. Cap. 6: 17. 1896. TYPE: Cape Caledon district, slopes of Zwartberg near the Baths, *Templeman s.n.* sub *MacOwan 2162* (K, S).

Plants 6–16 cm high, usually 2–4-branched. *Corm* small, but enclosed in large basketlike tunics, with cormlets produced round the base. *Leaves* 2, linear, glabrous, the lower basal, the upper produced well above the ground. *Stem* 2 internodes long, strongly flexed; all branches produced from the aerial node. *Spathes* herbaceous, pale green, sometimes with brown apices; inner spathe 3–5 cm long, the outer seldom more than half the inner. *Flowers* few, bright blue; outer tepals to 1.8 cm long, the claw short, ca. 5 mm long, reflexed to 45°; inner tepals to 1.6 cm long, also strongly reflexed. *Filaments* to 6 mm long, free at the apex only; *anthers* oblong, ca. 3 mm long, apiculate, red. *Style branches* plumose, the crests single with feathery outgrowths from the base. *Capsule* spherical-ovoid, 6–8 mm long; *seeds* angled. Chromosome number $2n = 20$.

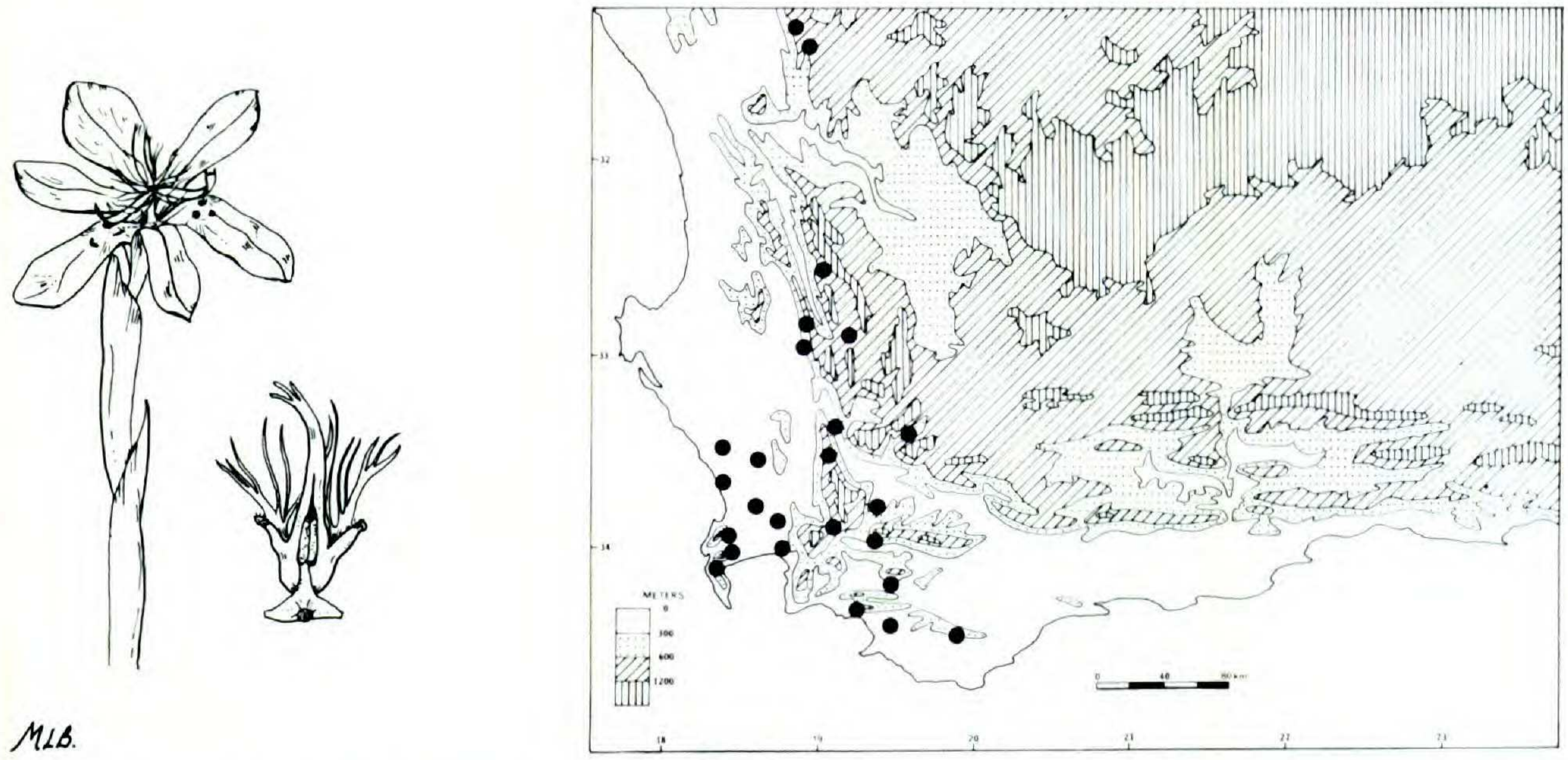

FIGURE 14. *Moraea lugubris*: distribution and flower (life size) with style branch and stamen enlarged.

Flowering time: Late August to early November.

Distribution: Common from Bredasdorp, westwards to Cape Town, also found north to Nieuwoudtville, usually in sandy soils, in damp places.—FIG. 14.

Moraea lugubris is a rather isolated species within section *Moraea*. Though distinct in several characteristics, it is remarkable for its corm tunics which usually form a large open network round the tiny corm (a feature apparently not developed in some forms) and particularly for the plumose style branches. The style crests themselves are not paired as in other members of the genus, but are single and irregular in outline, and are obscured by feathery plumose outgrowths. The species is usually quite small, and though common, is easily overlooked. It is found from the Caledon district in the south, along the west coast to Nieuwoudtville. Though the record suggests it is not common north of the Olifants River Mountains, this may be due to it being overlooked in this area rather than a true reflection of its distribution.

Moraea lugubris has a long taxonomic history, beginning with its collection by Sparrman who sent it to Linnaeus in 1773. Nothing was apparently done with the specimen until after Linnaeus's death when the younger Linnaeus decided to call it *M. iriopetala*. The description in the *Supplementum Plantarum* is, however, in such a form as to make *M. iriopetala* a superfluous synonym for *M. vegeta* (Goldblatt, 1976a).

Thunberg also collected *M. lugubris* and gave it the name *Iris plumaria*. Again, owing to the citation by Thunberg of *M. vegeta* in the synonymy, the selected epithet became a superfluous synonym for *M. vegeta*. Before *Iris plumaria* was transferred to *Moraea* by Ker in 1805, in which genus it can be treated as a valid new name, Salisbury proposed the name *Ferraria lugubris*, citing both earlier illegitimate names, *M. iriopetala* and *I. plumaria*, and this name is the one now applied to this plant. Klatt's *Moraea mira* appears to be no more than a later synonym since there is no indication that Klatt considered *M. mira* distinct from *M. lugubris*, then known as *M. plumaria*.

SOUTH AFRICA. CAPE: 31.19 (Calvinia): Grasberg, near Nieuwoudtville (AC), *Barker 9554* (NBG, PRE, STE). Nieuwoudtville, *Galpin 11141* (PRE).

32.19 (Wuppertal): Elands Kloof (CA), *Lewis s.n.* (BOL); *Barker 3119* (NBG). Mountain plateau above Porterville (CC), *Estherhuysen 16152* (BOL, NBG). Wabooms River, Cold Bokkerveld, *Hanekom 779* (K, PRE).

33.18 (Cape Town): Groenekloof (Mamre) (AD), *Zeyher s.n.* (SAM-70705). Near Porterville (BB), *Barker 8145* (NBG); *Steyn 586* (NBG). Near Malmesbury (BC), *L. Bolus s.n.* (BOL-20285). Near Gansekraal, Darling district (CA), *Barker 718* (NBG). Kirstenbosch, Window Stream (CD), *Esterhuysen 11838* (BOL). Near Claremont, Cape Peninsula, *H. Bolus 2833* (BOL, PRE). Camp Ground, Cape Peninsula, *Wolley Dod 861* (BOL, K). Botterberg near Philadelphia (DA), *Wasserfall 215* (NBG). Stellenbosch flats (DD), *Duthie s.n.* (BOL-15943); *Garside 265* (K). Bottelary hills, *Hafstrom & Acocks 320* (PRE, S).

33.19 (Worcester): Wolseley (Ceres Road) (AC), *Schlechter 8984* (BOL, GRA, K, MO, PRE, S). Hex River valley (BC), *Tyson 720* (SAM). Bothas Halt (CA), *Compton 18276* (NBG). Bains Kloof, *Lewis Grant 2356* (BOL). French Hoek Peak (CC), *Stokoe s.n.* (SAM-58744). Between Worcester and Villiersdorp, *Lewis 2972* (SAM); *Compton 22909* (NBG).

34.18 (Simonstown): Muizenberg plateau (AB), *Powers s.n.* (SAM-58963); *Lewis 1013* (SAM). Klawer valley, Cape Peninsula, *Lewis 20* (SAM). Bergvliet, *Salter 7642* (SAM). Olifantsbosch (AD), *Compton 23717* (NBG). Patrys Vlei, Cape Peninsula, *Wolley Dod 1496* (BOL, K). Cape Flats below Wynberg (BA), *Schlechter 1545* (GRA, K). Firgrove (BB), *Compton 13472* (NBG); *Leighton 249* (BOL).

34.19 (Caledon): 8 km SW of Villiersdorp (AA), *Story 3047* (PRE). Slopes of Zwartberg (AB), *Templeman* sub *MacOwan 2612* (K, S). Hermanus (AC), *H. Bolus 9829* (BOL). 3 km from Stanford, near vlei (AD), *Gillett 4447* (BOL, MO). Drayton siding, E of Caledon (BA), *Goldblatt 340* (BOL). The Poort, 12 km from Bredasdorp (DB), *Dymond s.n.* (BOL-21228).

Section 2. **Acaules** Baker [as subgenus *Eumoraea* (section) *Acaules*], Fl. Cap. 6: 9. 1896. TYPE: *Moraea ciliata* (L.f.) Ker.

Plants small, with stem entirely subterranean. *Leaves* 3 to several, basal, canaliculate, linear-ensiform, not distinct from the spathes. *Stem* simple, or branching below ground. *Spathes* not distinct from the leaves, usually only the innermost entirely sheathing. *Flowers* borne on contractile pedicels; tepals unguiculate, the inner whorl erect to spreading. *Capsules* retracted into the spathes after flowering, borne near ground level, clavate, soft walled; *seeds* angular. Basic chromosome numbers $x = 10, 9$.

Distribution: Species occur over the entire winter rainfall region as well as in marginal areas to the east and north; one species extends from the west coast through the central karoo to East Griqualand.

Section *Acaules* comprises four species, all with a similar reduced vegetative habit in which the stem is entirely subterranean. The inflorescences are borne at ground level and the flowers are raised on pedicels which contract after flowering so that the fruit develops within the spathes. The unspecialized flowers, which have large inner tepals, are fugaceous and last only for part of a day. The flowers are also very delicate and particularly difficult to preserve, usually deliquescing and sticking to drying paper. Important floral characters are thus often lost in herbarium material.

The many-leafed habit and basic chromosome number of $x = 10$ place section

Acaules firmly in subgenus *Moraea*, and it is probably derived from section *Moraea* in which similar karyotypes are found (Goldblatt, 1976a). The base number of $x = 9$ in certain forms of *Moraea tricolor* is clearly derived from the ancestral $x = 10$.

11. **Moraea falcifolia** Klatt, Abh. Naturf. Ges. Halle 15: 366. 1882; Baker, Fl. Cap. 6: 12. 1896. TYPE: South Africa, Cape, Hantam Mountain, *Meyer* (1869) (B, lectotype; S, isolectotype).

M. galaxioides Baker, Handbook Irid. 49. 1892. TYPE: South Africa, Transvaal, *Mrs. Barber* (1872) (K, holotype).
M. fasciculata Klatt, Abh. Naturf. Ges. Halle 15: 366. 1882. TYPE: South Africa, Cape, "Langevaley," *Drège 2600* (B, holotype; K, P, S, isotypes).
Galaxia peduncularis Beguinot, Malpighia 23: 211. 1909. TYPE: South Africa, Cape, "Langevaley," *Drège 2600* (B, holotype).

Plants small, to 5 cm high, forming a dense sessile rosette. *Corm* to 2 cm in diameter; tunics of coarse dark fibers, often bearing cormlets round the base. *Leaves* several, some indistinguishable from the inflorescence spathes, slender, canaliculate, to 10 cm long, linear, falcate or loosely coiled, the margins frequently undulate and crisped. *Stem* not produced above ground, usually branching to give rise to several inflorescences. *Spathes*, especially the outer, sheathing at the base only, with well-developed equitant apices and not clearly distinct from the leaves, the inner usually entirely sheathing, to 2.5 cm long with membranous margins. *Flowers* several, white to cream with yellow nectar guides outlined in purple; outer tepals 1.5–2.2 cm long, the limb 8–11 mm long, to 15 mm wide; inner tepals 1.3–2.0 cm long, spreading. *Filaments* to 6 mm long, joined in the lower half; *anthers* 3–4 mm long. *Style branches* ca. 8 mm long, the crests 5–8 mm long. *Capsule* spherical-ovoid, to 1 cm long; *seeds* globose to slightly angled. Chromosome number $2n = 20$.

Flowering time: May to August(–September).

Distribution: Widespread in karoid or semikaroid vegetation from the southwestern Cape to the western Transvaal.—FIG. 15.

Moraea falcifolia was treated as a summer rainfall area species (Goldblatt, 1973) and its range in the Karoo and dry regions of the northern Cape, as well as the Cape West Coast and Namaqualand, make it one of the few species of *Moraea* found in both summer and winter rainfall areas. The extreme eastern form, from the western Transvaal, recognized by Baker as *M. galaxioides*, grades without noticeable discontinuity into western Cape forms which include the types of *M. falcifolia* from the Calvinia district and *M. fasciculata* from Langvlei, on the west coast. I have found *M. falcifolia* to be much more common than the record indicates: the very fugaceous flowers are seldom seen and the small plants themselves are apparently often overlooked.

Moraea falcifolia is allied to the more common western Cape species, *M. ciliata*, and belongs in section *Acaules*, which is characterized by the absence of an aerial stem and a contractile pedicel which pulls the ovary down to ground level after flowering. Though *M. falcifolia* is quite distinct within section *Acaules*, it may occasionally be confused with other species. It is distinctive in having

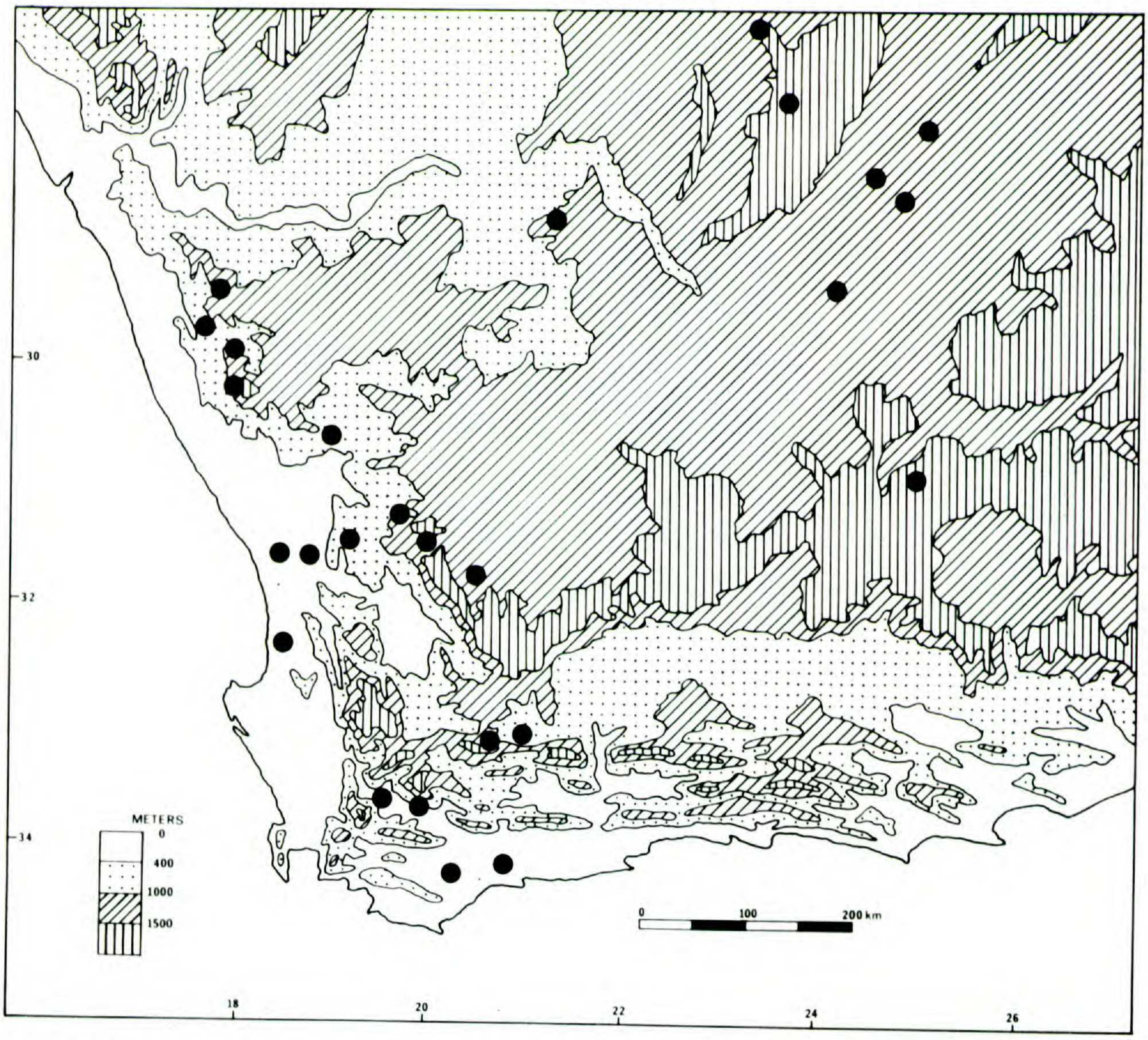

Figure 15. Distribution of *Moraea falcifolia*.

dark corm tunics and usually falcate, glabrous leaves that only rarely have a ciliate margin.

SOUTH AFRICA. CAPE: 27.23 (Kuruman): Baltharos (AD), *Silk 67* (BOL).

29.21 (Kenhardt): Jagbult, Kenhardt district (DA), *Acocks 12684* (K).

28.23 (Griekwastad): Danielskuil (BA), *Pole-Evans 98* (K, PRE); *Ekersohn 1339* (PRE).

28.24 (Kimberley): Witfontein, Barkly West, *Acocks 2482* (BOL, M, PRE). Diamond Fields, *Tuck s.n.* (K). Klip Drift, Vaal River (DA), *Barber s.n.* (K), *14*(K). Du Toit's Pan, *Tuck 13* (K).

29.17 (Springbok): Near Okiep (DB), *Foxwell s.n.* (K). Near Nababeep Wells, *Bolus 6578* (BOL). Concordia, *Schlechter 11343* (K, BM, BR, BOL, PRE). Mesklip (DD), *Compton 5410* (BOL, NBG).

29.24 (Hopetown): Newlands (AD), *Paton s.n.* (BOL-30838).

30.17 (Kamiesberg): Kamieskroon (BB), *Salter 868* (BOL).

30.19 (Loeriesfontein): 40 km N of Loeriesfontein (CB), *Hall 1385* (NBG).

31.18 (Van Rhynsdorp): Sandveld, Vredendal (CB), *Hall 4029* (BOL, NBG). Van Rhynsdorp (DA), *Salter 2506* (BOL). Foot of Giftberg, S of Van Rhynsdorp, *Goldblatt 636* (BOL).

31.19 (Calvinia): Glenlyon, Nieuwoudtville (AC), *Goldblatt 564* (BOL). Near Nieuwoudtville, *Salter 4551* (BOL); *Barker 9406* (NBG). Akkerdam, Calvinia (BC), *Lewis 5910* (NBG). Hantam Mountain, *Meyer 12* (B).

31.20 (Williston): Langfontein, SE of Calvinia (CA), *Hall 4254* (NBG).

31.24 (Hanover): 25 km NW of Naauwpoort (BA), *Acocks 14293* (PRE).

33.19 (Worcester): 15 km SW of Worcester (CA), *Stayner s.n.* (NBG-81696). Over Hex, *Morris 159* (NBG). Near Robertson (DD), *van Niekerk 583* (BOL).

33.20 (Montagu): Whitehill (BA), *Compton 3240* (BOL, NBG).

34.20 (Bredasdorp): Napky, Swellendam district (AB), *Acocks 22253* (PRE). Potteberg North (B), *Taylor 7198* (PRE).

Without precise locality: Transvaal, *Barber s.n.* (K).

12. **Moraea ciliata** (L.f.) Ker, Ann. Bot. (König & Sims) 1: 241. 1805. Baker, Fl. Cap. 6: 11. 1896, incl. vars.—FIG. 16.

Iris ciliata L.f., Suppl. Pl. 98. 1781. TYPE: South Africa, Cape, hills near Cape Town, *Thunberg s.n.* (Herb. Thunberg 1116, UPS, lectotype).

Moraea hantamensis Klatt, Abh. Naturf. Ges. Halle 15: 365. 1882. TYPE: South Africa, Cape, Hantam Mountain, *Meyer s.n.* (B).

M. macrochlamys Baker, Handbook Irid. 49. 1892. TYPE: South Africa, Cape, Sneeubergen, Graaff Reinet, *Drège 2186* (K, lectotype; B, S, isolectotypes).

Plants usually small, 2.5–15(–20) cm high, unbranched and with the stem entirely subterranean. *Corm* to 1.5 cm in diameter; tunics of medium to coarse pale fibers. *Leaves* usually (–2)3–4(–6), erect and usually exceeding the inflorescence, or falcate, 0.5–3.5 cm wide, lightly pubescent, rarely glabrous, the margins always ciliate, often undulate to lightly crisped. Stem entirely subterranean, cormiferous at the nodes. *Spathe* enclosing the inflorescence solitary, herbaceous, often pubescent. *Flowers* several to many, fugaceous, white, blue, or yellow to pale brown, the nectar guide yellow, heavily scented; outer tepals broadly lanceolate, 2–3.5 cm long, the limb 1–2.5 cm long; inner tepals 1.6–3.0 cm long, linear-spathulate to narrowly lanceolate and ± erect or outspread. *Filaments* (3–)5–10 mm long, usually united only at the base; *anthers* 3–5 mm long. *Style branches* 7–15 mm long, the crest 8–15 cm, ± linear to lanceolate. *Capsule* enclosed by the spathe and leaf bases, soft walled; *seeds* with ± spongy testa. Chromosome number $2n = 20, 40$.

Flowering time: July to September.

Distribution: Clay or sandy slopes and flats from Namaqualand in the north to the Grahamstown district in the east.—FIG. 17.

Moraea ciliata is extremely specialized vegetatively, being much reduced in size and lacking an aerial stem. Though seedlings have a fairly typical, long, channeled leaf, mature plants have short spathelike leaves, the inner one of which encloses the inflorescence. While vegetatively specialized and reduced, the flowers of species in section *Acaules* are little modified from the basic pattern in *Moraea*.

Moraea ciliata occurs in a variety of color forms, either blue, white, yellow, or brown and is very characteristically sweet scented. It has two close allies which are very alike vegetatively. *Moraea macronyx*, a high altitude species is always recognized by its very long tepal claw and relatively shorter limb, and by rather corklike corm tunics. *Moraea tricolor* has quite differently arranged tepals with a relatively short claw and outspread limb and very broad style crests. The general appearance of this flower is of parts closely held together in contrast with

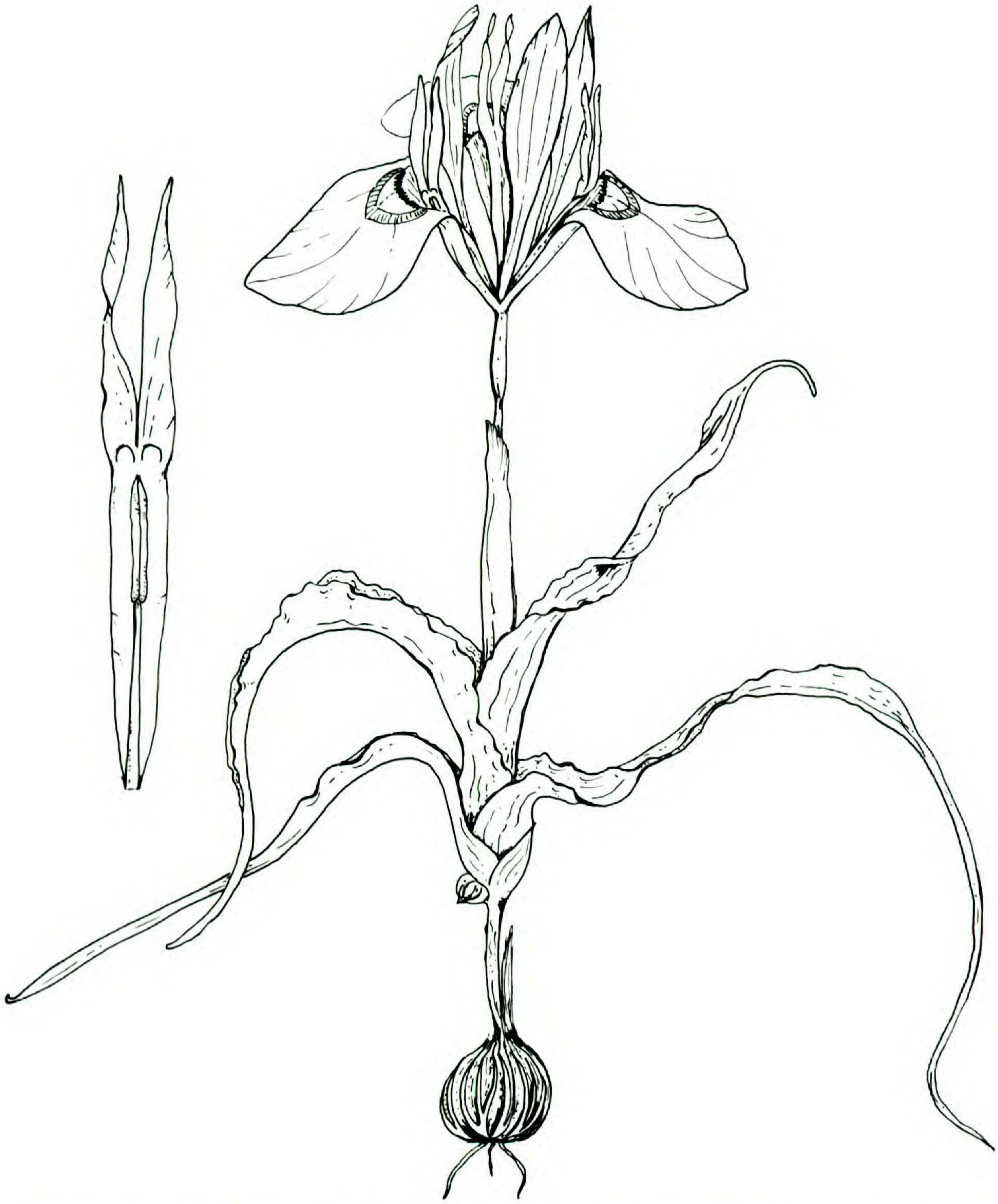

Figure 16. Morphology of *Moraea ciliata* (life size) with style branch and stigma enlarged.

the narrow, laxly arranged tepals and narrow style crests of *M. ciliata.* Most forms of *M. ciliata* are diploid, $2n = 20$, but a polyploid population has been found on clay soil in the Caledon district where *M. ciliata* was sympatric with *M. tricolor.* At this locality *M. tricolor* had $2n = 20$, in contrast to the more usual $2n = 18$.

Two species are treated as synonymous with *M. ciliata*: *M. macrochlamys* is regarded as a robust form although from a region peripheral to the general range of the species, while *M. hantamensis* from the Calvinia district matches exactly plants from the Cape Peninsula, the type locality.

Moraea minuta, described at the same time as *M. ciliata* by the younger Linnaeus and often regarded as a synonym, is not included as accurate typification is not possible (see under excluded species).

Moraea ciliata is a particularly widespread species, ranging from Namaqualand in the north to near Grahamstown in the east, and occurring in all areas between, including isolated sites in the arid Great Karoo. Though it is tolerant of very varied conditions from high rainfall on the Cape Peninsula (ca. 762 mm) to less than 127 mm in parts of Namaqualand and the Karoo, it responds only to winter rainfall, and in the parts of the Karoo which now receive mainly summer rains, the existing populations are almost certainly relictual.

South Africa. CAPE: 29.17 (Springbok): Top of Spektakel Pass, W of Springbok (DA), *Goldblatt 638* (BOL). Springbok (DB), *Salter 915* (BOL). Flats near Okiep, *Goldblatt 637* (BOL).

30.17 (Hondeklipbaai): 8 km SW of Kamieskroon (DB), *Acocks 19317* (K, NBG, PRE). 65 km S of Springbok on Leliefontein road, *Nordenstam 664* (NBG, S).

30.18 (Kamiesberg): Between Garies and Bitterfontein (C), *Leipoldt 3848* (BOL). Near Leliefontein, Kamiesberg (AC), *Goldblatt 633* (BOL).

31.18 (Van Rhynsdorp): Holrivier, Vredendal (CB), *Booysen 152* (NBG). Heerenlogement mountains (DC), *Fisher 9* (NBG). Olifants River barrage (DD), *Compton 11168* (NBG).

31.19 (Calvinia): Blaauwkrans, 50 km NW of Calvinia (AB), *Lewis 2754* (SAM). Near Nieuwoudtville (AC), *Barker 6523* (NBG); *Lewis 5846* (NBG); *Leipoldt 3849* (BOL). Glenlyon, Nieuwoudtville, *Lewis 5885* (NBG); *Strauss s.n.* (NBG-90218). 16 km E of Nieuwoudtville (AD), *Lewis 5865* (NBG). Calvinia commonage (BD), *Marloth 10237* (PRE). Hantam Mountain, *Meyer 13* (B); *Marloth 12802* (PRE).

31.20 (Williston): 4 km NW of Middelpos (CC), *Acocks 18460* (K, PRE).

31.24 (Hanover): Verlate Plaats (AC), *H. Bolus 8746* (BOL). Compasberg, Sneeubergen (D), *Drège 2186* (K, S).

32.18 (Clanwilliam): Near Redelingshuys (AD), *Loubser 2171* (BOL). Boschkloof (BB), *Schlechter 8472* (BOL, K, PRE, S).

32.19 (Wuppertal): Pakhuis Pass (AA), *Salter 2449* (BOL); *Compton 6616* (NBG). Welbedacht Kloof, Cedarberg, *Stokoe s.n.* (SAM-55670).

32.20 (Sutherland): Top of Verlate Kloof (DA), *Marloth 9647* (PRE); *Goldblatt 548* (BOL). Voelfontein (B), *Hall 196, 197* (both NBG).

33.18 (Cape Town): Donkergat (AA), *Goldblatt 427* (BOL). Between Moorreesburg and Piketberg (BB), *Barker s.n.* (BOL-20211). Signal Hill, Cape Town (CD), *Thunberg s.n.* (UPS); *Marloth 166* (BOL, PRE); *Barnard s.n.* (BOL, SAM); *Zeyher 30* (PRE, SAM). Near Durbanville (DC), *Salter 2672* (BOL).

33.19 (Worcester): Hills near Porterville (AA), *Schlechter 10718* (BOL, BR, K, PRE, S). Saron, *Schlechter 7863* (K, PRE, S). Cold Bokkeveld (AB), *Schlechter 8890* (BOL, BR, PRE, S). Gydo Pass, *Leipoldt s.n.* (BOL). Swaarmoed, Ceres district (AD), *Loubser 983* (NBG). Top of Hex River Pass (BD), *Stayner s.n.* (NBG-88046). Worcester (CB), *Steyn 202* (NBG).

33.20 (Montagu): Matjesfontein, near station (BA), *Goldblatt 658* (BOL). Whitehill Ridge, *Compton 3261* (BOL, NBG). Montagu (CC), *Page s.n.* (BOL-17719).

33.22 (Oudtshoorn): Meiringspoort (BC), *Loubser 995* (NBG).

33.26 (Grahamstown): Carlisle bridge (AA), *Bayliss 2306* (MO).

34.18 (Simonstown): Kommetje, Cape Peninsula (AB), *Wolley Dod 1657* (BOL). Vlei at Chapmans Bay, *Wolley Dod 1651* (BOL).

34.19 (Caledon): Between Eseljacht and Queen Anne (AA), *Goldblatt 2498* (MO).

34.20 (Bredasdorp): Wydgelegen (AD), *Barker 4543* (NBG).

34.21 (Riversdale): Oakdale (A), *Muir 2690* (BOL).

13. **Moraea macronyx** Lewis, Ann. S. African Mus. 40: 115. 1954. TYPE: South Africa, Cape, Gydo Pass, *Lewis s.n.* (SAM-61920).

Plants similar in habit to *Moraea ciliata*, 9–18(–25) cm high. *Corm* to 1.3 cm in diameter; tunics pale, of fibers or entire corklike layers, cormiferous at the base and bearing suckers. *Leaves* 3, falcate, glabrous or lightly pubescent, the margins straight to undulate, ciliate. *Spathe* enclosing the inflorescence solitary, glabrous to pubescent. *Flowers* several, pale yellow and white; outer tepals 4–6 cm long, the claw 2.5–4 cm long, up to about twice the length of the limb, ca. 2 cm wide; inner tepals 3–4.5 cm long, linear-lanceolate, obtuse, to 7 mm at the widest point. *Filaments* 1.2–1.8 cm long, joined for ca. 6 mm; *anthers* linear, to 9 mm long, apiculate. *Style branches* ca. 2 cm long, to 5 mm wide, the crests to 2.5 cm long. *Capsule* and *seed* not known. Chromosome number $2n = 20$.

Flowering time: September to mid October.

Distribution: Southern Cold Bokkeveld and east to the Laingsburg district and the Long Kloof.—FIG. 17.

Moraea macronyx, described only quite recently, is closely allied to the well-known and widespread *M. ciliata*, and falls entirely within the geographic range of this species. It differs consistently from *M. ciliata* and remains quite distinct from forms of *M. ciliata* growing in the same area, which indicates that specific status is well deserved. It can readily be distinguished from other species of section *Acaules* by the very long claw to the tepals, which are at least twice as long as the limb. The corm tunics are also distinctive, being entire and peculiarly soft, as if composed of loosely packed cells; *M. ciliata* has, in contrast, fibrous tunics, though occasionally these approach the type found in *M. macronyx*.

Though originally believed to occur only in the Cold Bokkeveld, *M. macronyx* has recently been recorded from the Hex River-Matroosberg area, Tweedside, and well to the east, in the Long Kloof near Avontuur. All records have in common a fairly high altitude, though plants apparently grow in both sandy and clay soils, this also being a feature of *M. ciliata*. The distribution indicates an unusually wide disjunction for the genus, and *M. macronyx* may well be discovered in intervening areas in suitable habitats.

SOUTH AFRICA. CAPE: 32.19 (Wuppertal): Leeurivier, Cold Bokkeveld (CD), *Barker 3802* (NBG); *Lewis 1397* (SAM); *Mauve 4679* (K, PRE, STE). Helpmekaar, Cold Bokkeveld, *Hanekom 1291* (PRE). De Keur, *Barker 3118* (NBG); *Loubser 2020* (NBG).

33.19 (Worcester): 9 km N of top of Gydo Pass (AB), *Lewis 2533* (SAM); *Johnson 504* (NBG, STE). Elandsfontein, *Martin s.n.* (BOL). Groenfontein, *Barker 3113* (NBG). Welvaart, foot of Sandrift Peaks (BC), *Oliver 5071* (STE, MO). Near Matroosberg station (BD), *Mauve & Oliver 1265* (MO, STE).

33.20 (Montagu): Tweedside (AB), *Barker 7468* (NBG).

33.23 (Willowmore): Avontuur (CA), *Goldblatt 2860* (K, MO, NBG, PRE).

14. **Moraea tricolor** Andrews, Bot. Rep., *tab.* 83. 1800. TYPE: Illustration in Bot. Rep., *tab.* 83.

M. ciliata (L.f.) Ker var. *tricolor* (Andrews) Baker, Fl. Cap. 6: 11. 1896.

Iris fugax Persoon, Syn. Pl. 1: 54. 1810, nom. illeg., superfl. pro *Moraea tricolor* Andrews. TYPE: As for *M. tricolor* Andrews.

M. barbigera Salisb., Trans. Hort. Soc. London 1: 306. 1812. TYPE: Illustration in Bot. Mag., *tab. 1012* (*M. ciliata* var.).

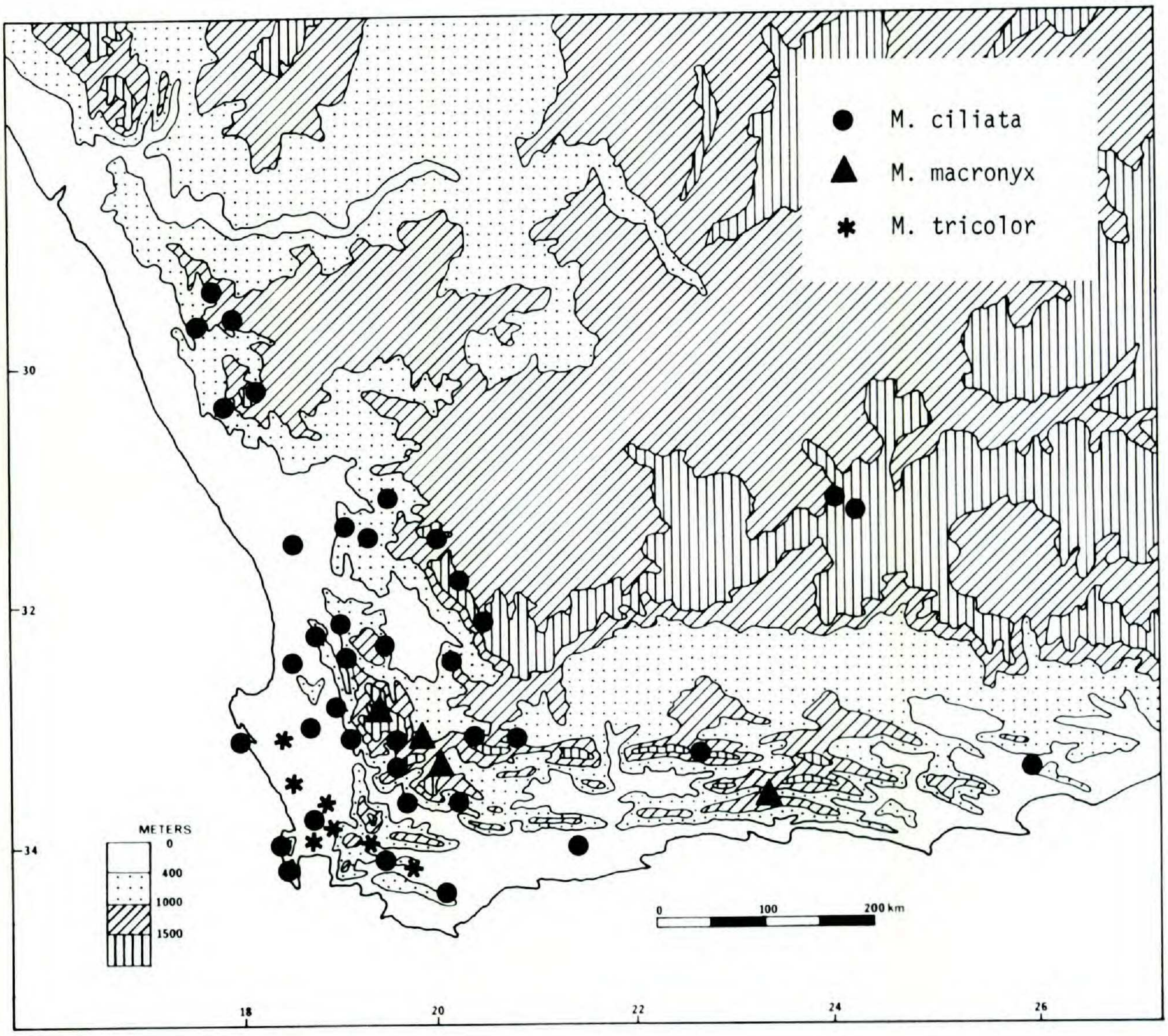

FIGURE 17. Distribution of *Moraea ciliata*, *M. macronyx*, and *M. tricolor*.

M. ciliata var. *barbigera* (Salisb.) Baker, Fl. Cap. 6: 11. 1896.
M. duthieana L. Bol., Ann. Bolus Herb. 4: 113. 1927. TYPE: South Africa, Cape, 15 km W of Stellenbosch, *L. Bolus s.n.* (BOL-18529, holotype; K, isotype).

Plants small, 5–15 cm high, unbranched, the stem entirely subterranean. *Corm* ca. 1.5 cm in diameter; tunics of medium to coarse, pale fibers. *Leaves* usually 3, ± erect, exceeding the spathe, glabrous or lightly pubescent, the margins ciliate, usually straight, or lightly undulate. *Stem* subterranean, cormiferous at the nodes. *Spathe* enclosing the inflorescence, solitary, glabrous or lightly pubescent. *Flowers* several, fugaceous, yellow, red or light purple, the nectar guide yellow; outer tepals 2–2.5 cm long, lanceolate, outspread, the limb 8–13 mm long; inner tepals 2–2.5 cm long, lanceolate, distinctly clawed, spreading. *Filaments* 3–4 mm long, united at the base only; *anthers* 2.5–3 mm long. *Style branches* to 5 mm long, the crests 8–10 mm long, exceeding the style branches and broadly triangular, ca. 5 mm wide. *Capsule* enclosed in the inflorescence spathe and leaf bases, soft walled; *seeds* unknown. Chromosome number $2n = 18, 20$.

Flowering time: Late July to mid September.

Distribution: Moist clay slopes or wet depressions in the Caledon, Cape, and Malmesbury districts.—FIG. 17.

Moraea tricolor was first regarded as a species distinct from its close relative *M. ciliata*, by Andrews in 1800, and subsequently by Salisbury (in 1812) and Louisa Bolus (in 1927); the latter two persons gave the plant different names primarily because of color differences. The type of *M. tricolor*, an illustration, is clearly the beautiful red-flowered form from the Darling district of the southwestern Cape. A yellow form, also found in this area, is more common, extending north and east to Hopefield and Stellenbosch. Both red- and yellow-flowered forms from this western coastal belt are glabrous, with only the leaf margins bearing minute ciliate hairs. To the east, in the Caledon district, a third form with a pink to purple flower is, by contrast, markedly pubescent.

Cytologically *M. tricolor* is variable, the western forms (two populations examined) have a diploid number of $2n = 18$; the Caledon forms (again two sites studied) have $2n = 20$. This latter number is basic in subgenus *Moraea*, and occurs in all other species of section *Acaules*. This suggests *M. tricolor* is specialized, and plants with $2n = 18$ represent aneuploid derivatives from the ancestral group. The occurrence of both $2n = 20$ and 18 in this species is noteworthy as heteroploidy is very unusual in the genus. Flowers of the $2n = 20$ and $2n = 18$ forms are, however, so similar that it is not possible to separate the forms taxonomically.

Moraea tricolor, probably recently evolved from the widely distributed *M. ciliata*, presumably maintains its identity by virtue of the cytological differences between it and *M. ciliata*: the pink Caledon forms with $n = 10$ are isolated from sympatric populations of *M. ciliata* by polyploidy in the latter; while the west-coast forms with $n = 9$ are isolated by aneuploid differences.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Near Hopefield (AB), *Axelson 206* (NBG). Near Darling (AD), *Lewis Grant 4610* (MO). Klipheuwel, damp flats (DA), *Lewis 5601* (NBG). 25 km S of Malmesbury, *Goldblatt 2178* (MO). Damp places 15 km W of Stellenbosch (DD), *L. Bolus s.n.* (BOL-18529). Upper flats, Stellenbosch, *Duthie 505* (BOL); *Garside 266* (K).

34.18 (Simonstown): Between Strand and Gordons Bay (BB), *Parker 4331* (K).

34.19 (Caledon): Drayton siding E of Caledon (BA), *Goldblatt 2516* (M). 18 km E of Caledon, *Barker 10615* (NBG). Fairfield (BD), *Lewis 5285* (NBG).

Section 3. **Deserticola** Goldbl., Ann. Missouri Bot. Gard. 63: 7. 1976. TYPE: *Moraea bolusii* Baker.

Plants small to medium, few to several branched. *Corms* with outer layers of tunics dark brown to black, the fibers fairly coarse. *Leaf* solitary, basal, canaliculate or terete. *Stems* well developed, usually branched, often frequently. *Flowers* with unguiculate, reflexed tepals with the inner whorl entire and large. *Capsules* clavate and exserted; *seeds* small and angled in those species in which fruits are known. Basic chromosome number $x = 10$.

Distribution: Dry areas of the north western Cape and extreme southern South West Africa.

The section comprises four closely related species, all occurring in very arid areas in southern Africa. The affinities of section *Deserticola* lie with species such as *Moraea serpentina* of section *Moraea*, which has a similar asymmetric corm with dark tunics. The difference between the sections is in leaf number, with *M. serpentina* and other species of section *Moraea* having two or more, often several, leaves. Cytologically, section *Deserticola*, with $n = 10$ and a characteristic karyotype of five long acrocentric chromosome pairs and five much shorter ones, is close to section *Moraea*, especially *M. serpentina* and *M. tortilis* where the same pattern is found.

15. **Moraea saxicola** Goldbl., sp. nov. TYPE: South Africa, Cape, 5 km W of Steinkopf, *Goldblatt 3057* (MO, holotype; K, NBG, PRE, S, isotypes).—FIG. 18.

Planta (10–)20–40 cm alta, caule ramoso. *Cormus* ca. 2 cm latus, tunicis atrobrunneis, supra productum. *Folium* solitarium, canaliculatum, marginibus hyalinis, crassis, undulatis ad crispis; folium raro teres. *Flores* pallidi coerulei aut albi ad cremei; *tepala exteriora* 2.5–4 cm longa, unguis 1–1.5 cm longa; *tepala interiora* breviora, reflexa. *Capsula* et *semina* ignota.

Plants (10–)20–40 cm high, usually several branched. *Corms* ca. 2 cm in diameter; tunics dark brown, finely netted, extending upward in a neck. *Leaf* solitary, somewhat exceeding the inflorescence, usually canaliculate, 4–8 mm wide, with thickened yellow margins, either straight or undulate, sometimes crisped; juvenile plants often with terete leaves coiled near the apex. *Stem* erect, with short branches held close to the axis. *Spathes* usually dry at flowering time, often lacerated; inner spathe 3–6 cm long, the outer about 1 cm shorter. *Flowers* pale blue or white to cream, the nectar guides yellow to orange; *outer tepals* 2.5–4 cm long, the limb ca. 1.5–2 cm, reflexed at ca. 45°; inner tepals smaller and shorter, also reflexed. *Filaments* 7–13 mm long, joined in the lower half; *anthers* 6–9 mm long, slightly exceeding the stigma, the pollen white. *Style branches* 8–15 mm long, the crests 1.0–1.5 cm long, lanceolate. *Capsules* not known. Chromosome number $2n = 20$ (*Goldblatt 3057*, type collection).

Flowering time: September to October.

Distribution: Stony slopes and flats on clay soils in Namaqualand, also occasionally on granite.—FIG. 18.

Although until recently very poorly collected, *Moraea saxicola* is fairly common throughout Namaqualand, and it is particularly abundant wherever clay and shale outcrops occur. It blooms rather late in the season, mainly in October, which perhaps accounts for the paucity of collections, since this is generally after the flowering season in Namaqualand. Flowers open after 1 P.M. and in the north after 3 P.M., which is another reason it has been overlooked.

In northern Namaqualand, on the clay soils near Steinkopf and at Spektakel Pass, a pale blue form occurs, while to the south, from near Garies to Nuwerus, plants have creamy white flowers. Leaves are generally broad and slightly undulate but crisped margins may be found in plants in the south. Unusually for *Moraea*, young plants have a juvenile leaf form which is terete and coiled only near the apex. By the time these plants reach flowering age, the leaf is usually typically channelled, but occasionally, as for example a collection from

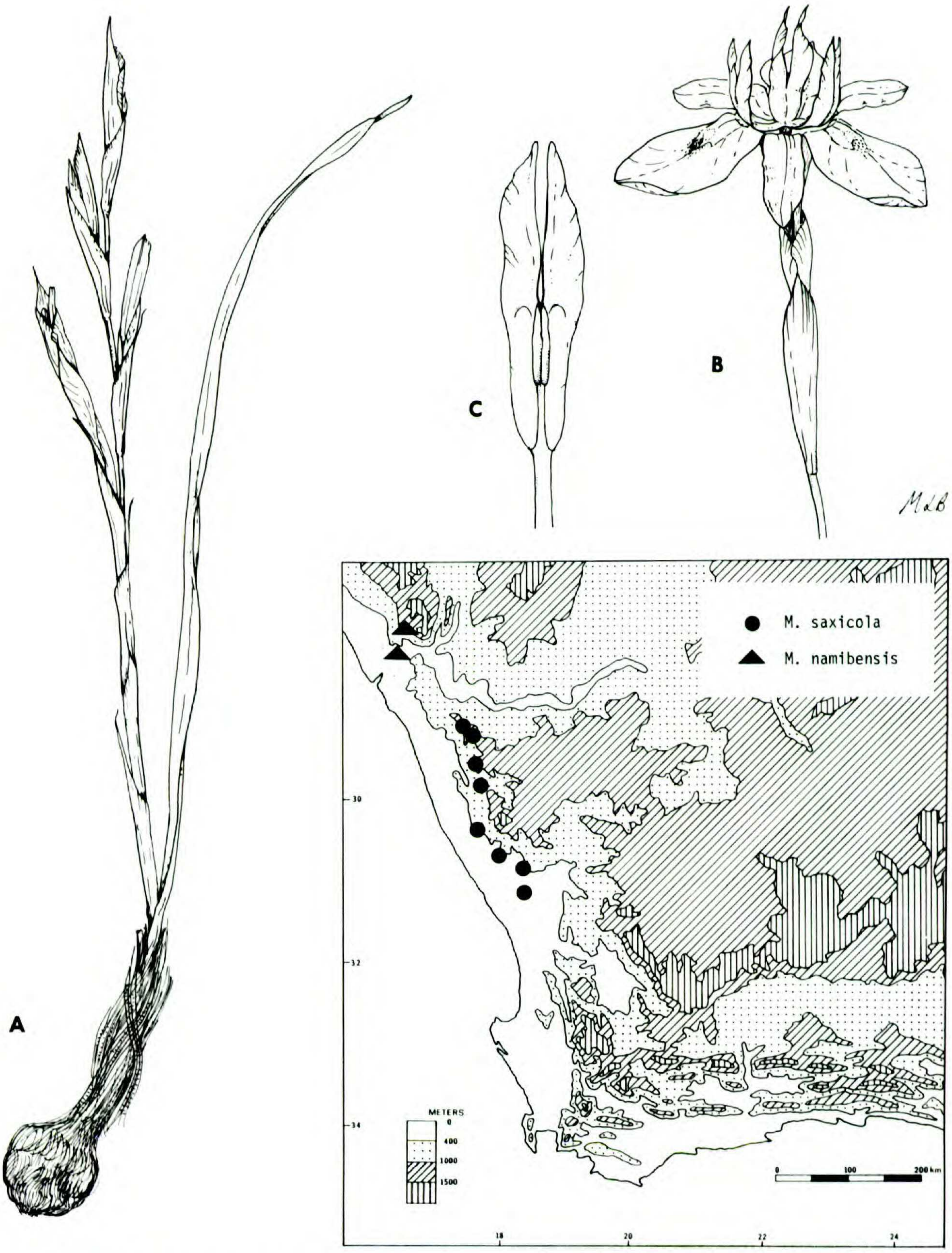

FIGURE 18. Distribution of *Moraea saxicola* and *M. namibensis* with morphology of *M. saxicola*.—A. Habit (×0.5).—B. Flower (life size).—C. Style branch and stamen (enlarged).

south of Springbok, *Acocks 19584*, plants with a juvenile leaf produce flowers. In the case of this collection it is not known whether plants of this population have this terete leaf throughout their lives.

Moraea saxicola is allied to *M. bolusii*, a common yellow-flowered Namaqualand species with an undulate leaf, and to the newly described *M. macgregorii*, which grows to the south in the Calvinia-Van Rhynsdorp area and also blooms in the late afternoon.

SOUTH AFRICA. CAPE: 29.17 (Springbok): Ca. 4 km W of Steinkopf (BA), *Wisura 2488* (NBG); *Strauss 140* (NBG); *Goldblatt 3057* (K, MO, NBG, PRE, S). Koufontein (BC), *Herre s.n.* (STE-11834). Ca. 22 km W of Springbok (CA), *Rodin 2190* (BOL, K, MO). E slopes of Spektakelberg, *Goldblatt 3047* (MO, NBG, PRE, S). 45 km S of Springbok (DD), *Acocks 19584* (K, M, NBG, PRE).

30.17 (Hondeklipbaai): 10 km N of Garies (DB), *Goldblatt 4256* (MO).

30.18 (Kamiesberg): Between Garies and Bitterfontein (CC), *Goldblatt 4257* (MO).

31.18 (Van Rhynsdorp): Near Nuwerus (AB), *Goldblatt 4258* (MO, NBG). 30 km SW of Nuwerus (AC), *Acocks 19596* (K, M, NBG, PRE).

16. **Moraea macgregorii** Goldbl., sp. nov. TYPE: South Africa, Cape, foot of Van Rhyns Pass, *Goldblatt 3097* (MO, holotype; NBG, isotype).—FIG. 19A–B.

Planta 12–25 cm alta, caule ramoso. *Cormus* ca. 2 cm latus, tunicis brunneis, reticulatis supra extensis. *Folium* solitarium, canaliculatum, marginibus hyalinis. *Flores* pallidi coeruleililacini; tepala exteriora ca. 3 cm longa, limbis ca. 1.5 cm longis; tepala interiora ca. 2.5 cm longa, reflexa. *Capsula* ca. 1.5 cm longa, clavata, rostrata; *semina* angulata.

Plants medium to small, 12–25 cm high. *Corm* ca. 2 cm in diameter; tunics of light brown, fine-netted fibers extending upward in a neck. *Leaf* solitary, much exceeding the inflorescence, trailing, 3–4 mm wide, canaliculate, the margins thickened. *Stem* flexuose, several branched. *Spathes* herbaceous in the lower part to completely dry at flowering, occasionally lacerated; inner spathe 3–3.5 cm long, the outer slightly shorter. *Flowers* pale lilac, the nectar guides prominent, golden; outer tepals ca. 3 cm long, the limb ca. 1.5 cm long, reflexed to 45°; inner tepals also reflexed, narrowly lanceolate, ca. 2.5 cm long. *Filaments* 1.5 cm long, joined in the lower half; *anthers* 3–4 mm, the pollen whitish. *Style branches* ca. 1.8 cm long, the crests narrow, to 1 cm long. *Capsule* ca. 1.5 cm long, clavate, distinctly beaked to ca. 1.5 mm long; *seeds* small, angled. Chromosome number $2n = 20$ (*Goldblatt 3097*, type collection).

Flowering time: October.

Distribution: Dry stony, lower mountain slopes in the Van Rhynsdorp district; flowers opening about 4:00 P.M.—FIG. 20.

Collections of a strange *Moraea*, often identified as *M. fugax*, prompted the search for living populations of the species now described as *M. macgregorii*. The type collection was made at the foot of Van Rhyns Pass between Van Rhynsdorp and Nieuwoudtville, in an area frequently visited and passed by botanists. The reason for the paucity of earlier collections and lack of good flowering material was immediately evident: flowers of *M. macgregorii* only open after 4:00 P.M.—on cooler days after 4:30 P.M.—and fade in the early evening, thus lasting only about two and one-half hours. This is probably the shortest flowering period of any species of *Moraea*.

Vegetatively there is little to distinguish *M. macgregorii*; it has a solitary, rather narrow undulate leaf, a short, branched stem, and rather dry, scarious spathes. Apart from the single leaf, it resembles *M. serpentina*, with which it grows. The flower is, however, striking, and the pale bluish tepals with their

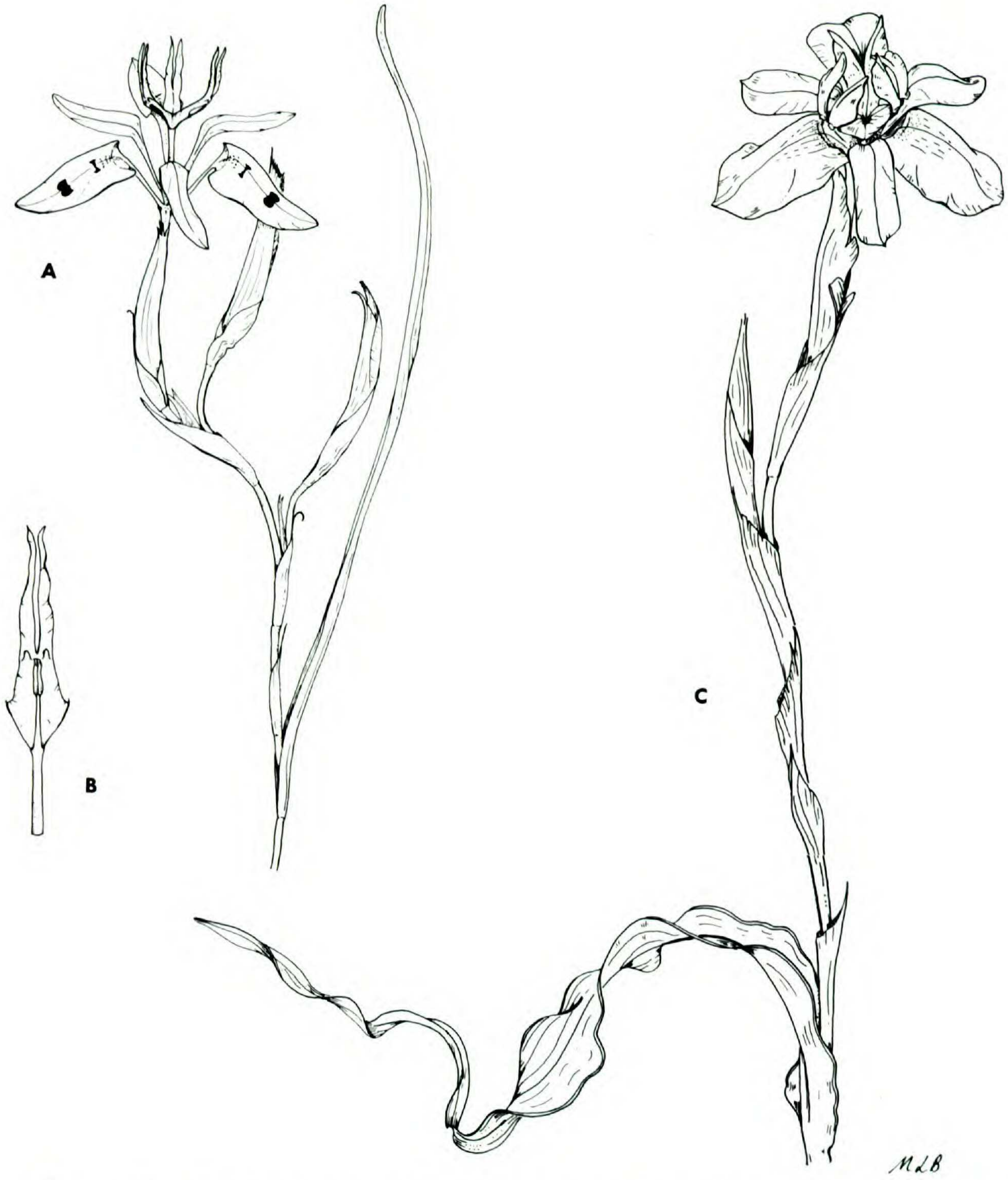

FIGURE 19. *Moraea* species.—A–B. *M. macgregorii*.—A. Whole plant (× 0.75).—B. Style branch and stamen (× 1.5).—C. *M. bolusii* (life size).

long very narrow claw, narrow reflexed limb, and characteristic nectar guides all indicate that *M. macgregorii* is a quite distinct species. Though apparently isolated in section *Deserticola*, it is most nearly allied to *M. saxicola* and *M. bolusii*, both characteristic species of the arid regions of Namaqualand and the Van Rhynsdorp area.

The species is named in honor of the MacGregor family, farmers in the Nieuwoudtville district who have for many years been prominent in the area as nature lovers and avid conservationists. Few can equal their knowledge of the unique and striking flora of the Nieuwoudtville district and their help, unstintingly extended to all visitors to the area, botanists and tourists alike, is acknowledged here with gratitude.

South Africa. cape: 31.19 (Calvinia): Foot of Van Rhyns Pass near Nieuwoudtville (AC), *Barker 9653* (NBG, S, STE); *Goldblatt 3072* (MO, NBG), *3097* (K, MO, NBG, PRE).

17. **Moraea namibensis** Goldbl., sp. nov. type: South West Africa, sandy flats near Udabib, *Merxmüller & Giess 3299* (W, holotype; M, PRE, isotypes).

M. edulis (L.f.) Ker, sensu Sölch, Prodr. Fl. S.W. Afr. 155: 11. 1969.

Planta 12–40 cm alta, pauciramosa. *Tunici* cormi tenui-reticulati. *Folium* solitarium, basale, canaliculatum. *Flores* albi ad caerulei; tepala exteriora 3.5–4 cm longa, lanceolata, limbus ca. 2 cm; tepala interiora ca. 3.5 cm longa, integra, lanceolata. *Filamenta* connata in pars dimidia. *Rami styli* ca. 1 cm longi, cristae ad 1.5 cm longa.

Plants erect, 12–40 cm high. *Corm* ca. 2 cm diameter; tunics dark, finely reticulate. *Leaf* solitary, inserted at ground level, linear, canaliculate, exceeding the inflorescence. *Stem* erect, usually several branched. *Spathes* several flowered, herbaceous with membranous, brown-tipped apices, 3.5–6 cm long; outer spathe about half the length of the inner. *Flowers* white or pale blue, the nectar guides yellow; outer tepals ca. 4 cm long, the limb 2 cm long, flexed at the knee; inner tepals ca. 3.5 cm long, lanceolate and obtuse, (apparently erect). *Filaments* ca. 1 cm long, joined for half their length; *anthers* 6 mm long. *Style branches* ca. 1 cm long, the crests lanceolate, 1.5 cm long. *Capsule* and *seeds* unknown.

Flowering time: August.

Distribution: Sandy flats, southwestern South West Africa.—Fig. 18.

This species, known only from two gatherings, is quite distinct from *Moraea fugax*, to which, as *M. edulis*, it was assigned in Merxmüller's *Prodromus einer Flora von Südwestafrika*. While the flowers of the two species are similar, the leaf, produced from the base of the stem in *M. namibensis*, contrasts with an insertion high on the stem, just below the spathes, in *M. fugax*. The corm tunics of *M. namibensis* are also distinctive, being dark brown and forming a fine reticulum in contrast to the pale, often rather coarse fibers of *M. fugax*. Although all too poorly known, *M. namibensis* appears to be most closely related to the group of Namaqualand species which embraces the undulate-leafed *M. bolusii* and *M. saxicola*, the distinctive species found mainly on clay outcrops in Namaqualand.

Moraea namibensis occurs in the extreme south of the Namib Desert in the southwest corner of South West Africa, an area which receives a small amount of winter precipitation. It is the only winter rainfall species of *Moraea* recorded outside the Cape Province.

South West Africa. 27.16 (Witpütz): Sandy flats near Udabib (CB), *Merxmüller & Giess 3299* (M, PRE, WIND). Zebrafontein, Witpütz-Sud (D), *Merxmüller & Giess 28752* (M).

18. **Moraea bolusii** Baker, Handbook Irid. 57. 1892. type: South Africa, Cape, near Okiep, *H. Bolus 6574* (K, lectotype; BOL, isolectotype).—Fig. 19C.

Plants 7–20 cm high, few branched, solitary or in clumps. *Corm* 1–2 cm in diameter; tunics of coarse black fibers usually extending upwards in a neck.

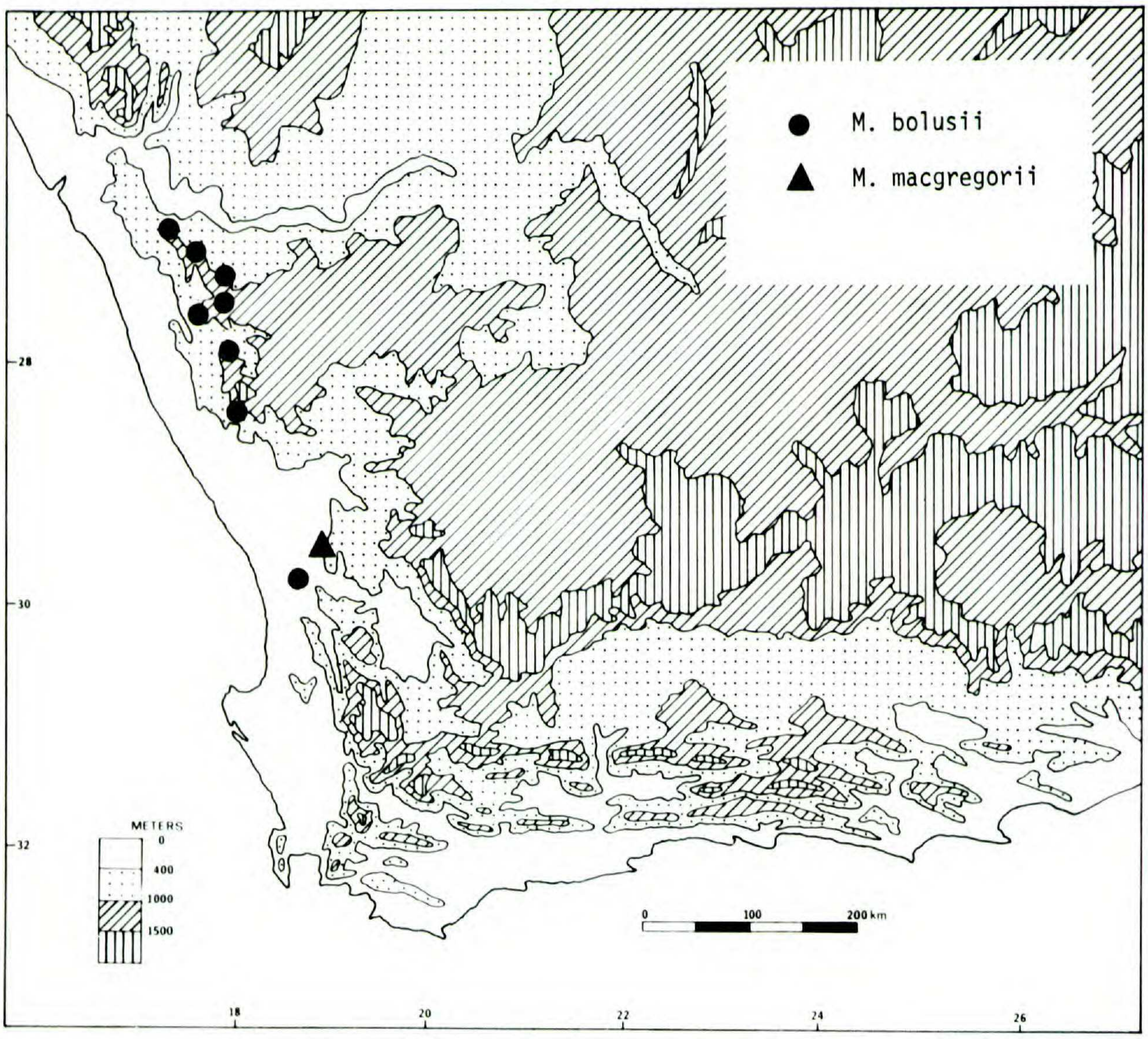

Figure 20. Distribution of *Moraea bolusii* and *M. macgregorii*.

Leaf solitary, glabrous, often longer than the stem, erect or trailing, linear, canaliculate, the margins usually undulate. *Stem* simple or few branched, the branches held close to the axis, the cauline bracts dry and membranous. *Spathes* usually dry at flowering time, acute or lacerated; inner spathe 3–4.5 cm long, the outer ± half the inner. *Flowers* usually pale yellow and white, occasionally pale lilac; outer tepals 2.6–3.3 cm long, broadly lanceolate, to 1.3 cm wide, reflexed to 45°; inner tepals ca. 2.5 cm long, reflexed. *Filaments* 7–10 mm long, joined for about two-thirds of their length; *anthers* ca. 6 mm long. *Style branches* ca. 1 cm long, the crests 1–1.5 cm long, broadly ensiform. *Capsule* and *seeds* not known. Chromosome number $2n = 20$.

Flowering time: September to October.

Distribution: In shallow sandy soils from the Van Rhynsdorp district north to Namaqualand where it is comparatively common.—Fig. 20.

Moraea bolusii, a fairly widespread Namaqualand species, was first collected by Bolus and by Schlecter in the late nineteenth century and was described by Baker. Subsequent collections have been few, but personal observation has shown it to be relatively common, especially in the Springbok district growing in shallow sandy soil, on flats or slopes.

The species can usually be recognized even when not in flower as its fairly wide, solitary, undulate leaf is distinctive. The flower is much like that in most species of section *Deserticola,* with quite broad, reflexed inner tepals. The flower, however, is typically yellow with paler style branches and crests, while most representatives of the section are blue flowered, particularly its closer allies *M. saxicola* and *M. macgregorii.* A collection from near Klawer (*Compton s.n.*) which has a pale lilac flower is also referred to *M. bolusii* somewhat expanding the concept and range of this species. The Klawer specimens have the typical undulate leaf, black corm tunics, and few-branched scape and thus differ mainly in flower color.

South Africa. cape: 29.17 (Springbok): Kinderle, Steinkopf (BC), *Hall 843* (NBG). Foot of quartzite hill, between Okiep and Steinkopf, *Goldblatt 2772* (MO). Near Okiep (DB), *H. Bolus 6574* (K, BOL). Roadside N of Okiep, *Goldblatt 632* (BOL). Hills E of Nababeep, *Goldblatt 631* (BOL); *Strauss 141* (NBG). Leospoort near Concordia, *Schlechter 11357* (BOL, BR, K). 50 km SW of Springbok, granite hills (DC), *Acocks 19584* (NBG, PRE).

30.18 (Kamiesberg): 9 km S of Garies (CA), *Lewis 2328* (SAM).

31.18 (Van Rhynsdorp): Near Klawer (DC), *Compton s.n.* (BOL, NBG-58800).

Without precise locality: Richtersveld, *Meyer 48* (STE).

Section 4. **Subracemosae** Baker [as subgenus *Eumoraea* (section) *Subracemosae*], Fl. Cap. 6: 10. 1896, pro parte, emend. Goldbl., Ann. Missouri Bot. Gard. 63: 7. 1976. type: *Moraea fugax* (de la Roche) Jacq.

Plants small to large, few to many branched. *Corm* tunics pale, of medium to fine fibers. *Leaves* 1 or 2, inserted well above ground level at the base of the first branch. *Stem* branching freely, or with a few clustered branches. *Flowers* with entire, reflexed, unguiculate inner tepals. *Capsules* clavate-cylindrical, strongly beaked, often partly enclosed; *seeds* small, angular. Basic chromosome number, $x = 10, 8, 6$.

Distribution: Southwestern Cape and Namaqualand.

Section *Subracemosae,* as treated here, comprises only two species, the striking, many-branched *Moraea gracilenta* with $x = 10$, and the very variable aggregate species *M. fugax,* in which haploid numbers of $n = 8$ and $n = 6$ have been recorded. This range of chromosome numbers makes section *Subracemosae* appear as a bridge between the subgenera with $x = 10$ and $x = 6$, linking particularly subgenus *Moraea* to subgenus *Vieusseuxia.* The distinctive morphology of section *Subracemosae* with the peculiar leaf insertion and characteristic beaked ovary make it unlikely that this is the case. Derivation of the reduced chromosome number is accordingly suggested to have occurred independently in the two groups.

The similarity of karyotype in *M. gracilenta,* probably ancestral to the *M. fugax* complex, to the other sections of subgenus *Moraea* has been a major reason for including section *Subracemosae* here. The similarity is particularly close in section *Deserticola* and *M. serpentina* and *M. tortilis* of section *Moraea* where five large and five small chromosome pairs are found.

19. **Moraea gracilenta** Goldbl., sp. nov. TYPE: South Africa, Cape, sandy flats S of Pikenierskloof Pass, Piketberg district, *Goldblatt 3279* (MO, holotype; K, NBG, PRE, S, isotypes).—FIG. 21B–D.

M. edulis L.f. var. *gracilis* Baker, Handbook Irid. 56. 1892; Fl. Cap. 6: 21. 1896. TYPE: South Africa, Cape, Tulbagh Kloof to Pikeniers Kloof, *Zeyher 1647* (K, lectotype; PRE, S, isolectotypes).

Planta 30–80 cm alta, multiramosa. *Cormus* 1.5–2 cm diametro. *Folium* solitarium, lineare, canaliculatum. *Spathae* herbaceae, supra bruneae, apice acuta. *Flos* pallidus caeruleus-malvinus; tepala effusa; tepala exteriora 2–3 cm longa; interiora 1.8–2.8 cm. *Capsula* ca. 1 cm longa, rostrata.

Plants 30–80 cm high, many branched. *Corm* 1.5–2 cm in diameter; tunics of fine to medium pale fibers. *Leaf* solitary, canaliculate, linear, exceeding the inflorescence but usually trailing, inserted well above the ground at the base of the first branch. *Stem* erect and multibranched. *Spathes* herbaceous, becoming dry, the apices brown, acute; inner spathe 2.5–3.5(–4) cm long, the outer less than half the inner. *Flower* pale blue-mauve, strongly scented; outer tepals 2–3 cm long, ca. 8 mm at the widest point, lanceolate; inner tepals 1.8–2.8 cm long, 5–6 mm wide, spreading. *Filaments* ca. 5 mm long, united in the lower half; *anthers* 4–6 mm long, white. *Style* branches 7–9 mm long, the crests linear-lanceolate, 7–12 mm long. *Capsule* ca. 1 cm long, distinctly beaked; *seeds* angled. Chromosome number $2n = 20$.

Flowering time: Late September to November, extending to December at higher altitudes.

Distribution: Western coastal belt from Tulbagh Kloof to Clanwilliam, in sandy situations.—FIG. 21.

Moraea gracilenta has been known for many years, at least since the 1820s when Ecklon and Zeyher collected it near Tulbagh Kloof. Of the many systematists who studied Ecklon and Zeyher collections only J. G. Baker thought it worthy of taxonomic recognition and described it as *Moraea edulis* var. *gracilis*. It is indeed allied to *M. fugax*, the correct name for *M. edulis*, but it has several characteristics which indicate that it is a distinct species.

Firstly, it differs consistently from all the forms of the very variable *M. fugax* in its multibranched habit, very small blue flowers, and short inflorescence spathes and capsules. Secondly, it grows entirely within the geographic range of *M. fugax*, and the two occur within short distances of one another, yet their characteristics remain quite constant. Thirdly, the timing of flowering is markedly different: blooming occurs in the same months and the flowers of both species last a day only; however, while *M. gracilenta* blooms from about 3:30 P.M. to 7 P.M., flowers of *M. fugax* open between 11 A.M. and 12 noon and wilt by 6 P.M. The difference in flowering periods has been observed on three separate occasions in wild populations and appears to vary little. It is this differential that finally confirmed that *M. gracilenta* should be regarded as distinct from *M. fugax* and not simply a form of this widespread and variable species.

Moraea gracilenta occurs in the southwestern Cape along the western coastal belt between Tulbagh and Clanwilliam in valleys and on flats. It prefers very sandy situations where its corm becomes buried 15–25 cm below the ground.

The chromosome number $n = 10$ suggests that *M. gracilenta* is primitive in section *Subracemosae*, and ancestral to *M. fugax*, which has recorded numbers of $n = 8$ and 6. Its multibranched habit seems consistent with this contention, though in leaf number, *M. fugax* appears more primitive since individuals of this species sometimes have two leaves. The chromosome number and karyotype of *M. gracilenta* clearly link this species, and thus section *Subracemosae*, to section *Moraea* and section *Deserticola* where similar karyotypes are found.

SOUTH AFRICA. CAPE: 32.18 (Clanwilliam): Riverbank near Clanwilliam (BB), *Goldblatt 3076* (MO); *Galpin 11482* (B, K, PRE). Eendekuil (DB), *Loubser 851* (NBG). Sandy areas between Eendekuil and Pikenierskloof Pass, *Goldblatt 3279* (K, MO, NBG, PRE, S), *3029* (MO, NBG, PRE).

32.19 (Wuppertal): Near Warm Baths, Olifants River valley (CA), *L. Bolus s.n.* (BOL-20323, K, PRE). Elandskloof, *Compton 16748* (NBG).

33.19 (Worcester): Tulbagh Kloof to Pikenierskloof (AC), *Zeyher 1647* (K, PRE, S). Tulbagh Kloof, *Compton 12399* (NBG); *Ecklon & Zeyher 23* (MO). Gydo (AD), *Leipoldt 3004* (BOL, K, PRE).

20. **Moraea fugax** (de la Roche) Jacq., Hort. Bot. Vindob. 3:14, *tab. 20.* 1776.—FIG. 21A.

Vieusseuxia fugax de la Roche, Descr. Pl. Nov. 33. 1776. TYPE: Illustration in van Hazen, Cat. Pl. 67. 1759 (lectotype).

Iris edulis L.f., Suppl. Pl. 93. 1781. TYPE: South Africa, Cape, exact locality uncertain, *Thunberg s.n.* (Herb. Thunb. 1123, UPS, lectotype).

Moraea edulis (L.f.) Ker, Bot. Mag. *tab. 613.* 1803; Baker, Fl. Cap. 6: 20. 1896.

Vieusseuxia edulis (L.f.) Link, Enum. Pl. Hort. Berol. 1: 56. 1821.

Moraea corniculata Lam., Tabl. Encycl. Méth. 1: 114. 1791; Encycl. Méth. 4: 227. 1797. TYPE: South Africa, Cape, *Sonnerat s.n.* (P, lectotype).

Iris longifolia Schneevoogt, Ic. Pl. Rar. *tab. 20.* 1792; Andrews, Bot. Rep., *tab. 45.* 1799. TYPE: Illustrations in Schneevoogt, Ic., Pl. Rar. *tab. 20* (lectotype).

Moraea longifolia (Schneevoogt) Sweet, Hort. Brit., ed. 2, 496. 1830, nom. illeg., non *M. longifolia* (Jacq.) Pers., 1805.

M. odora Salisb., Parad. Lond. Tab. 1: 10. 1805. TYPE: Illustration in Parad. Lond. 1: *tab. 10* (lectotype).

M. filicaulis Baker, Handbook Irid. 56. 1892. TYPE: South Africa, Cape, *Drège 2605* (K, lectotype).

M. diphylla Baker, Bull. Misc. Inform. 1906: 42. 1906. TYPE: South Africa, Cape, Olifants R., *Penther 734* (K, lectotype).

Plants medium to large, 12–40(–50) cm high, branched. *Corm* (1–)1.5–3 cm in diameter; tunics usually pale, rarely dark, of fine to medium fibers. *Leaf* usually solitary, occasionally 2, equal or unequal in length, subopposite, inserted well above ground immediately below the first branch, canaliculate, usually much exceeding the stem and trailing. *Stem* erect or more often somewhat falcate, with a conspicuous, long lower internode, the branches crowded, often semicorymbose. *Spathes* herbaceous, becoming dry, the upper margin light brown, apices attenuate; inner spathe 4–8 cm long, the outer ca. ⅓ the length of the inner. *Flowers* white, blue, or yellow, strongly scented; outer tepals 2.3–4.0 cm long, lanceolate, the limb ± equal the claw; inner tepals 2–3.5 cm long, erect or slightly reflexed, 5–8 mm wide. *Filaments* 6–10 mm long, joined in the lower half; *anthers* 4–8 mm long. *Style branches* 1.5–2 cm long, the crests lanceolate

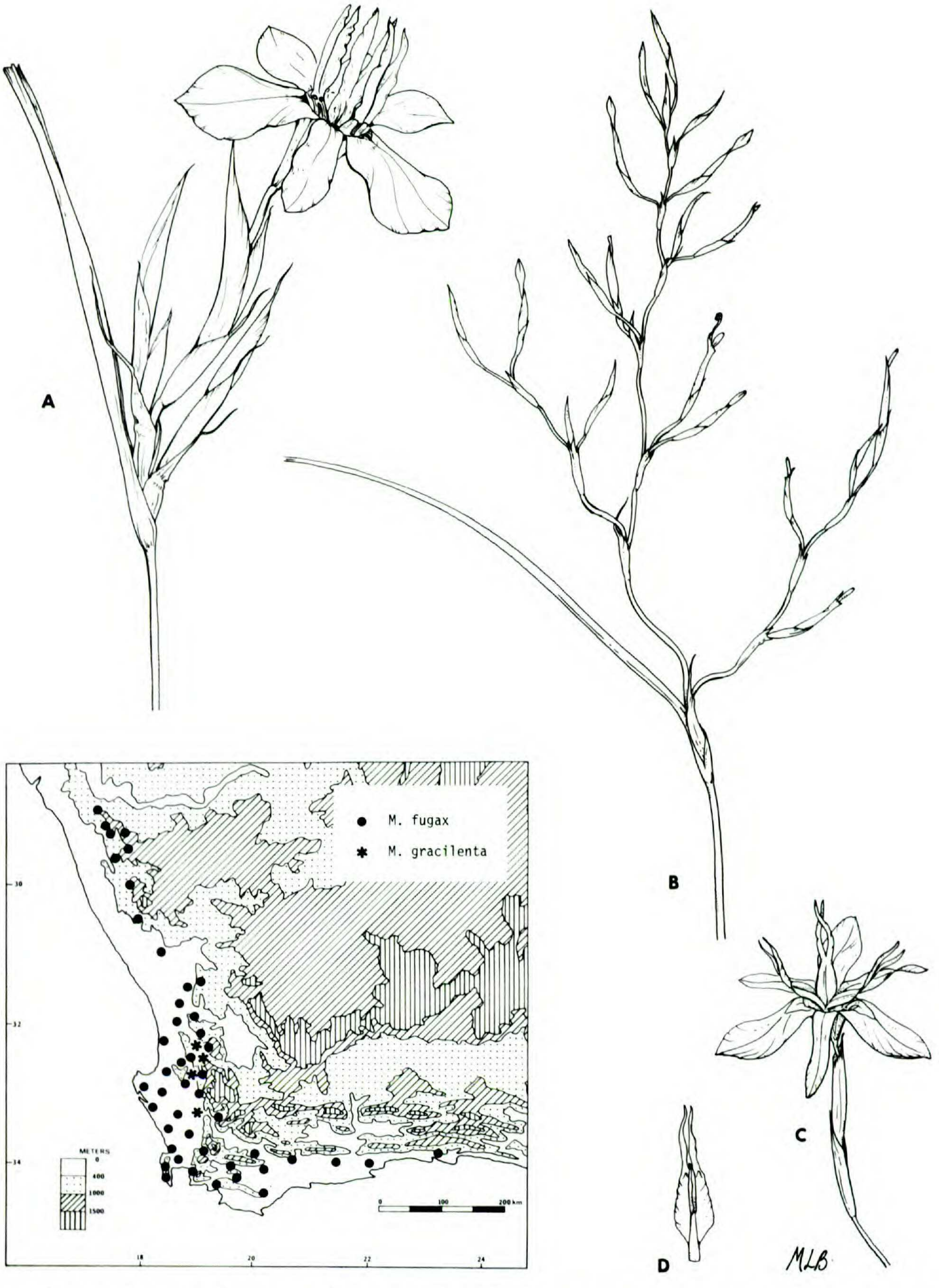

Figure 21. Morphology and distribution of *Moraea fugax* and *M. gracilenta*.—A. *M. fugax* (life size).—B–D. *M. gracilenta*.—B. Habit (× 0.5).—C. Flower (life size).—D. Style branch and stamen (× 1.5).

6–16 mm long. *Capsule* clavate to cylindrical, distinctly beaked, 1.5–2.5 cm long; *seeds* many, angled. Chromosome number $2n = 16, 12$.

Flowering time: August to November, extending into December at higher elevations.

Distribution: Southern Cape to Namaqualand, frequently in sandy situations.—FIG. 21.

As circumscribed here, *Moraea fugax* is a large aggregate species consisting of numerous forms, including *M. filicaulis* (*M. diphylla*), none of which are given taxonomic recognition. No clear pattern of variation is evident as yet, but a very detailed analysis of the range of forms will undoubtedly prove rewarding. The occurrence of diploid numbers of $2n = 16$ and 12 is noteworthy, the heteroploidy in this species being all the more significant as $n = 8$ represents one of the few records intermediate between the common base numbers, $n = 10$ and $n = 6$, in *Moraea*. A combined cytological and morphological study should be all the more interesting in view of this.

The characteristic features of *M. fugax* are the leaf insertion, well above the ground and just below the first branch, and the peculiar beaked ovary and capsule. These, as well as other features, are shared by *M. gracilenta*, and the two species are believed to be closely related in spite of the different chromosome number, $n = 10$, in *M. gracilenta*. This number, as well as a consistently greater degree of branching, form the basis for the suggestion that *M. gracilenta* stands in an ancestral position to *M. fugax*.

Amongst the various forms of *M. fugax* the following are worthy of mention:

a. A short, large yellow-flowered form, common in the southern Cape and Cape Peninsula, though extending as far north as the Calvinia district.

b. A large, white-flowered form (var. *longifolia*), common along the west coast, with a particularly long leaf, or occasionally with 2 equal or unequal leaves.

c. A late flowering blue form, usually tall and several branched, found from the Cape Peninsula to the Olifants River valley.

d. Dwarf, small white- or blue-flowered forms with either 1 or 2 filiform leaves found along the west coast between Saldanha and Namaqualand; occasionally grading into one or more of the larger forms.

e. A white-flowered form, intermediate between *b* and *d*, throughout Namaqualand.

Other variants have also been noted, but are much more local, and these, together with intermediates between all of the listed forms, make it impossible to subdivide *M. fugax* or to recognize subordinate taxa.

SOUTH AFRICA. CAPE: 29.17 (Springbok): Steinkopf (BC), *Meyer s.n.* (STE-9090). 33 km N of Springbok (BD), *Mauve 4156* (PRE). Spektakelberg (DA), *Barker 1340, 7423* (both NBG). Near Okiep (DB), *H. Bolus 6616* (BOL). 21 km SW of Springbok (DD), *Acocks 19576* (K, PRE).

30.17 (Hondeklipbaai): 14 km NNW of Garies (BD), *Acocks 14964* (PRE).

30.18 (Kamiesberg): Between Bitterfontein and Garies (C), *Pillans 6346* (BOL); *Leipoldt 3846* (BOL); Mts. near Naries (CA), *H. Bolus 6617* (BOL).

31.18 (Van Rhynsdorp): Van Rhynsdorp (DA), *Kolbe s.n.* (GRA); *Barker 3642* (NBG). 10 km N of Van Rhynsdorp, *Acocks 19499* (M, NBG, PRE). Vredendal commonage, *Hall 3843* (NBG, PRE, STE). N slopes of Giftberg (DC), *Goldblatt 207* (BOL). Nardouw Pass, *Lewis s.n.* (BOL-22205). Zandkraal (DD), *Acocks 14794* (K, PRE).

31.19 (Calvinia): Sandy places near Nieuwoudtville (AC), *Galpin 11128* (K, PRE). Doornbosch (CC), *Hall 3881* (NBG, STE).

32.18 (Clanwilliam): Lamberts Bay (AB), *Henrici 3300* (PRE). Near Olifants R. at Clanwilliam (BB), *Penther 734* (K). Rocky hills, Clanwilliam, *Henrici 2101* (PRE). Pakhuis Pass, *Barker 1999* (NBG); *Compton 9798* (NBG). Zoutkloof, Piketberg district (CD), *Leighton 133* (BOL). 2 km NW of Eendekuil (BB), *Howes 193* (PRE). Hills NW of Moutons Vlei (DC), *Pillans 7398* (BOL). Piketberg (DD), *Barker 2687* (NBG); *Compton 22989* (NBG).

32.19 (Wuppertal): Cedarberg Pass near Algeria (AC), *Goldblatt 3250* (MO).

33.18 (Cape Town): Langebaan (AA), *Lewis s.n.* (BOL). Between Hopefield and Langebaan, *L. Bolus s.n.* (BOL-20339, K). Near Hopefield, *Marloth 8207* (PRE). Groenekloof (AD), *Zeyher 1646* (K, PRE, S). Malmesbury (BC), *Barker 2554* (NBG). 10 km N of Malmesbury, *Goldblatt 3025* (MO, NBG, PRE). Near Sea Point, Cape Town (CD), *Wolley Dod 1611* (BOL). Kirstenbosch, *Barker 2066* (BOL); *Verdoorn s.n.* (PRE). Table Mountain, *Ecklon 823* (PRE-11149).

33.19 (Worcester): Hills near Saron (AA), *Schlechter 10605* (BR, K, PRE, S). Michells Pass (AD), *Schlechter 8966* (GRA). Near French Hoek (CC), *Gillett 1830, 1831* (both STE). 15 km from MacGregor on Bonnievale rd. (DD), *Marsh 806* (PRE, STE).

34.18 (Simonstown): Beyond Simonstown (AB), *Wolley Dod 505* (BOL, K). Fish Hoek, *Wolley Dod 1633* (BOL, K). Olifants Bos (AD), *Barker 3876* (BOL, NBG). Smitswinkel, Cape Peninsula, *Walgate 433* (NBG). Dunes near Strand (BB), *Parker 4141* (BOL, K).

34.19 (Caledon): Caledon (AB), *Gillett 1111* (STE). Onrust R. (AC), *Van Viekerk 300* (BOL). Spes Bona, Genadendal (BA), *Govt. Soil Survey 17* (PRE).

34.20 (Bredasdorp): Near Storms Vlei (AA), *Goldblatt 2923* (MO, PRE). 14 km E of Swellendam (BA), *Story 3090* (PRE). Zoetendals Vlei (CA), *Leipoldt 3559* (PRE).

34.21 (Riversdale): Riversdale (AB), *H. Bolus s.n.* (BOL).

34.22 (Mossel Bay): Mossel Bay (AA), *Burchell 6295* (K). Ruigte Vlei, near Knysna (BB), *Fourcade 1557* (BOL, GRA).

Section 5. **Tubiflora** Goldbl., Ann. Missouri Bot. Gard. 63: 7. 1976. TYPE: *Moraea cooperi* Baker.

Helixyra Salisb., Trans. Hort. Soc. London 1: 305. 1812, nom. nud.
Helixyra Salisb. ex N.E. Br., Trans. Roy. Soc. S. Africa 17: 348. 1929. TYPE: *H. flava* Salisb. = *Moraea longiflora* Ker.

Plants small to medium in size, several to many branched. *Leaves* 2 or more, the lower ± basal, linear, canaliculate. *Stem* subterranean or emergent and flexuose. *Flowers* with tepals united in a perianth tube; *inner tepals* present or entirely lacking. *Capsule* enclosed; *seeds* small, angular. Basic chromosome number $x = 10$.

Distribution: Southwestern Cape, in the Caledon, Worcester, and Stellenbosch districts and in Namaqualand.

Section *Tubiflora* comprises two very unusual species, *Moraea cooperi* and *M. longiflora*, both unique in *Moraea* in having a true perianth tube. *Moraea cooperi* is further unusual in having flowers solitary in each spathe and in lacking inner tepals. The multi-branched habit of *M. cooperi*, its two produced leaves, as well as the karyotype with three long and seven short chromosome pairs, link section *Tubiflora* to section *Moraea*, of which it is regarded as a very specialized offshoot.

The second species of section *Tubiflora*, *M. longiflora*, was assigned by Salisbury in 1812 to the invalidly described *Helixyra*, as *H. flava*. The generic distinction separating *Helixyra* from *Moraea* was the perianth tube, now known also in *M. cooperi*. *Helixyra* was later validated by N. E. Brown and also used as a subgenus of *Moraea* by Baker, but in both cases it was misinterpreted and species now regarded as belonging to *Gynandriris* were also included. The floral tube in *Gynandriris* differs fundamentally from that of *Helixyra* (i.e., *M. longiflora*) as in the former it is dervied solely from the ovary which has a sterile tubular extension.

21. **Moraea cooperi** Baker, Handbook Irid. 54. 1892. TYPES: South Africa, Cape, Worcester, *Cooper 1661* (K, lectotype); Tulbagh, *H. Bolus 5428* (K, syntype).—FIG. 22C–D.

M. stenocarpa Schlecht., Bot. Jahrb. Syst. 27: 93. 1900. TYPE: South Africa, Cape, between Bains Kloof and Ceres Road, *Schlechter 9082* (B, lectotype; BOL, GRA, MO, PRE, S, SAM, isolectotypes).

Gynandriris stenocarpa (Schlecht.) Foster, Contr. Gray Herb. 127: 47. 1939.

Moraea apetala L. Bol., S. African Gard. 19: 385. 1929. TYPE: South Africa, Cape, Stellenbosch Flats, *Duthie 1770* (BOL, holotype; K, isotype).

Gynandriris apetala (L. Bol.) Foster, Contr. Gray Herb. 127: 48. 1939.

Plants 15–25 cm high, moderately to much branched. *Corm* 1–1.5 cm in diameter; tunics of dark fibers. *Prophylls* brown and fibrous, forming a neck around the stem base. *Leaves* usually 2, linear, canaliculate, the lower basal, exceeding the inflorescence, the upper inserted well above ground. *Stem* flexuose, usually much branched. *Spathes* herbaceous with brown attenuate apices; inner spathe 3–5 cm long, the outer ca. ⅓ the inner. *Flowers* solitary in the spathes, pale yellow, purple veined; tepals united in a tube 1 cm long, the outer tepals 3.3–4.0 cm long, the limb ca. 2 cm long, to 2.0 cm wide, lanceolate, the inner tepals absent. *Filaments* to 6 mm, joined for ca. 2 mm; *anthers* 7–9 mm long. *Style branches* 1.2–1.5 cm long, the crests lanceolate, to 1 cm long. Chromosome number $2n = 20$.

Flowering time: Late September and October, occasionally in November at higher altitudes.

Distribution: Usually on well-watered flats, in the area between Caledon, Stellenbosch and Tulbagh.—FIG. 22.

While its very branched habit and chromosome number of $n = 10$ indicate its basically primitive position in *Moraea*, *M. cooperi* has such unusual features as a perianth tube, only three tepals, and solitary flowers. It is consequently seen as a rather divergent and specialized offshoot of subgenus *Moraea* and has, along with *M. longiflora*, been accorded sectional status. Its karyotype is similar to subgenus *Moraea* and indicates its alliance to this group (Goldblatt 1976a).

Since Baker described *M. cooperi* in 1892, two synonyms have appeared. Evidently both Schlechter (*M. stenocarpa*) and Louisa Bolus (*M. apetala*) did not realize the correct identity of *M. cooperi* (Baker's description is poor and incorrect in some aspects). Foster (1939) believed *M. cooperi* to be a *Gynandriris* owing to its perianth tube and thus transferred it to this genus. The floral tube in *Gynandriris* is, however, derived from a sterile prolongation of the ovary, while *M. cooperi* has a true perianth tube of united tepals, and there is thus no connection between *M. cooperi* and *Gynandriris*.

Moraea cooperi has a rather limited distribution, occurring only in the Caledon, Stellenbosch, and Tulbagh-Worcester districts. It is nowhere common and its usual habitat, fertile, well-watered flat areas, is being brought under intensive

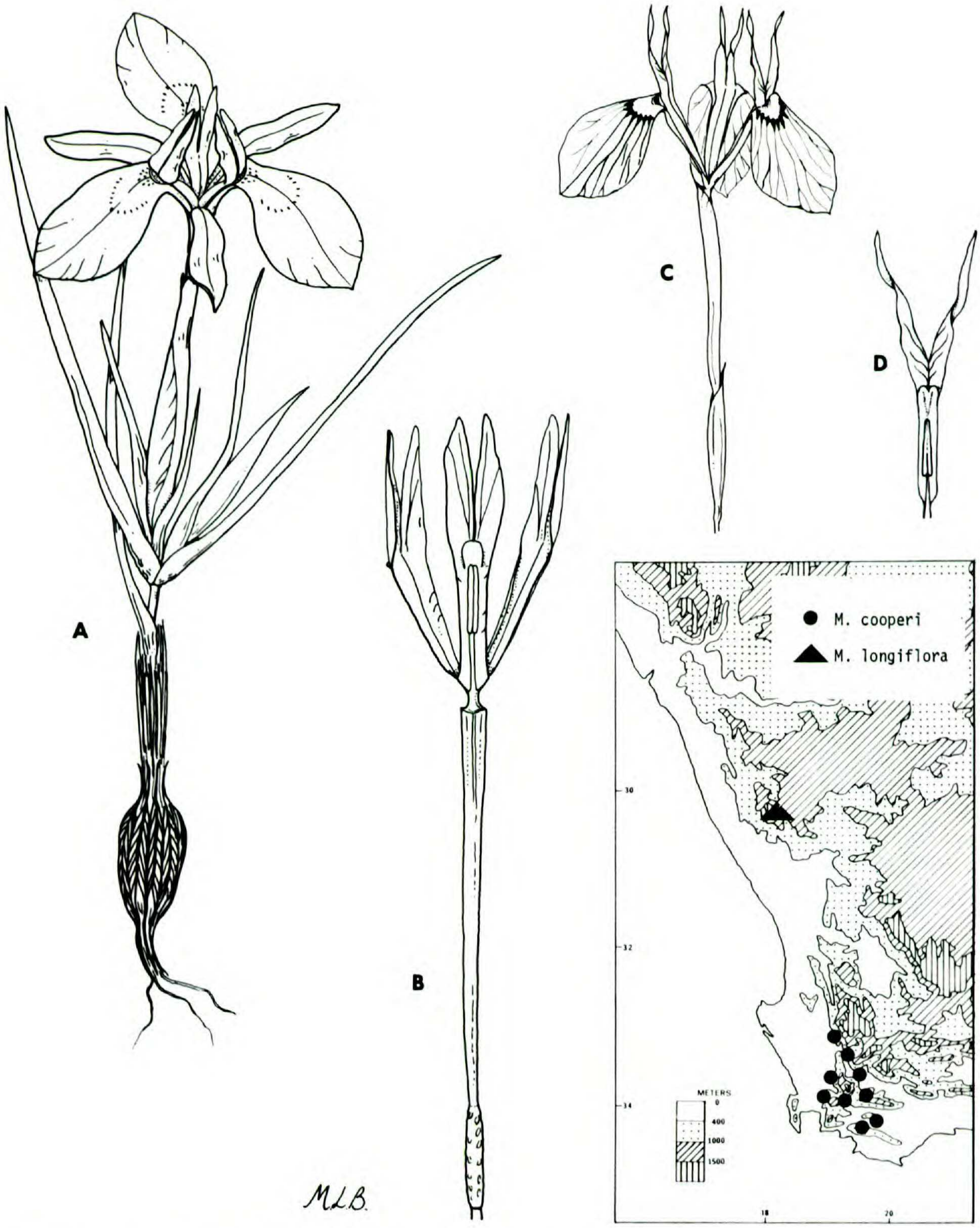

FIGURE 22. Morphology and distribution of *Moraea cooperi* and *M. longiflora*.—A–B. *M. longiflora*—A. Habit (× 1.5).—B. Perianth tube, stamens and gynoecium (× 2.5).—C–D. *M. cooperi*.—C. Flower (× 1.5).—D. Style branch and stamen (× 2.5).

agriculture, thus making it increasingly rare. It is notably responsive to fire and is seen most often on recently burnt ground.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Stellenbosch flats (DD), *Duthie 1770* (BOL, K). Banhoek, Stellenbosch, *Stanford s.n.* (BOL). Groot Drakenstein, *Rogers 17919* (BOL).

33.19 (Worcester): Saron (AA), *Lewis s.n.* (BOL). Winterhoek, near Tulbagh, *Bolus*

5284 (BOL, K). Near Tulbagh Waterfall, *Thompson 1524* (STE). Foot of Elands Kloof Mountains (AC), *Stokoe s.n.* (SAM-69629). Ceres Road (Wolseley), *Schlechter 9082* (B, BOL, GRA, K, MO, SAM, PRE). Slanghoek, flats (CA), *Rycroft 2354* (NBG). Du Toits Kloof, foot of Slanghoek Needle, *Esterhuysen 17819* (BOL, NBG, PRE). Darling Bridge, Bains Kloof, *Lewis 1990* (SAM). Pokkraal, near Rawsonville (CB), *Le Roux s.n.* (BOL, PRE-7814). French Hoek above village (CC), *Phillips 1302* (SAM). French Hoek Peak, *Stokoe s.n.* (SAM-58743).

34.19 (Caledon): Foot of Zwartberg (AB), *Guthrie s.n.* (BOL-16923). Roadside S of Caledon, *Goldblatt 441* (BOL). Drayton Siding E of Caledon, *Goldblatt 440* (BOL); *Mauve 4779* (PRE).

Without precise locality: Worcester, *Cooper 1661* (K).

22. **Moraea longiflora** Ker, Bot. Mag. *tab. 712.* 1804. TYPE: Illustration in Bot. Mag. *tab. 712.*—FIG. 22A–B.

Helixyra longiflora (Ker) N.E. Br., Trans. Roy. Soc. S. Africa 17: 349. 1929.
Gynandriris longiflora (Ker) Foster, Contr. Gray Herb. 114: 40. 1936.
Helixyra flava Salisb., Trans. Hort. Soc. London 1: 305. 1812, nom. illeg., superfl. pro *M. longiflora* Ker.

Plants small, ca. 5 cm high with 2–4 branches clustered at ground level. *Corm* spindle shaped, ca. 1 cm wide; tunics dark brown, very hard, reticulate. *Leaves* several, 1 basal, 4–6 cm long, rigid linear-filiform, canaliculate, the other leaves similar, clustered at ground level. *Spathes* herbaceous, 2.5–3 cm long; inner spathe entirely sheathing, the outer somewhat leaflike, sheathing for ca. 5 mm, free in the upper part. *Flowers* yellow with yellow orange nectar guides; tepals united in a tube 2–3 cm long, the outer tepals 2.3–3.0 cm long, the limb to 2 cm long, spreading, the inner tepals 1.7–2.2 cm long, also spreading or becoming reflexed. *Filaments* 5–6 mm, united in the lower third; *anthers* ca. 5 mm long. *Style branches* 1.0–1.2 cm long, the crests to 1 cm long. *Capsule* and *seed* unknown. Chromosome number unknown.

Flowering time: October.

Distribution: Recorded only from the Kamiesberg in Namaqualand where it is very local in moist sandy situations.—FIG. 22.

Moraea longiflora has until very recently been an enigma, no South African plant being known resembling the type which is an excellent illustration in Curtis's *Botanical Magazine*. According to Ker who described it, the species was sent to him by George Hibbert MP, a director of the East India Company and enthusiastic grower of Cape plants, two years after Hibbert himself had flowered it at his garden in Clapham, London. Hibbert had received the corms from the Cape shortly before this, probably in 1800 or 1801. According to the *Hortus Kewensis* ed. 2, which includes *Moraea longiflora*, the corms were collected and sent to Hibbert by James Niven who had in 1798 been employed by Hibbert and sent to collect plants for him in the Cape.

Moraea longiflora remained known only from the painting until 1976 when accompanied by my wife, Margaret, I visited the Kamiesberg rather late in the season, in mid October, in search of corms of various Iridaceae known from the area. Nothing could have been more surprising than the rediscovery of this plant which my wife found and realized was very unusual. The two remarkable features of the plants, a long perianth tube and underground stem, reminded me of the *Botanical Magazine* plate of *M. longiflora*, and on later examination was found to match it in every detail. It is almost certain that the original collection of *M. longiflora* was made in the Kamiesberg, since, according to Dr. John Rourke, Niven visited the Kamiesberg soon after his arrival in the Cape in 1799 or 1800.

Unusual though the species is, *M. longiflora* bears a passing resemblance to *M. cooperi*, the only other species of *Moraea* with a perianth tube. The two are most likely closely related and have been grouped together in section *Tubiflora*.

SOUTH AFRICA. CAPE: 30.18 (Kamiesberg): E slopes of Rooiberg, near Welcome, 1100 m (AC), *Goldblatt 4317* (K, MO, NBG, PRE, S).

II. Subgenus VISCIRAMOSA

Subgenus **Visciramosa** Goldbl., Ann. Missouri Bot. Gard. 63: 7. 1976. TYPE: *Moraea bituminosa* (L.f.) Ker.

Plants medium to large, several to many branched. *Corm* tunics distinctive, entire and dark brown, with bituminous inner surfaces. *Leaves* 2–3, canaliculate. *Stem* well developed with viscous, sticky nodes, branching repeatedly. *Flowers* with entire, spreading or reflexed tepals. *Style branches* produced and with distinct crests or reduced, without crests and overtopped by anthers. *Capsule* ovoid to clavate; *seeds* angled. Basic chromosome number $x = 10$.

Distribution: Winter rainfall area from Namaqualand in the north to Grahamstown in the east, with a concentration of species in the Cape Town and Caledon districts.

Subgenus *Visciramosa* is a very distinct alliance in *Moraea*. The distinctive corm tunics with their sticky, bituminous surface, the branched axis, and viscous stems, as well as rather short spathes all suggest that the group is only distantly related to other subgenera. The karyotype is unlike that found in any of the other groups with a base number of $x = 10$; the chromosomes grade from large to small without the sharp size differences found in subgenus *Moraea*.

In contrast with the distinctiveness of the subgenus, the five species recognized are closely allied, and differ only in small details. The decision to recognize these five species was governed by the absence of intermediates between taxa, as well as the existence of clearly distinguishable habitats and ranges for each. Vegetative morphology is almost identical, *M. bituminosa* and *M. bulbina* differing primarily in size from *M. viscaria*, *M. inconspicua*, and *M. elsiae*. Flower structure is more variable, and important considerations are length of tepals, their orientation, either spreading or reflexed, and, in the case of *M. elsiae* (and in a form of *M. viscaria*), reduction of style branches and crests.

23. **Moraea bituminosa** (L.f.) Ker, Ann. Bot. (König & Sims) 1: 240. 1805. —FIG. 23A–B.

Iris bituminosa L.f. Suppl.: 98. 1781. Type: South Africa, Cape, "prope Bergrivier, Vierentvingtigrivieren et alibi," *Thunberg s.n.* (Herb. Thunberg 1114, UPS, lectotype).
Vieusseuxia bituminosa (L.f.) Eckl., Top. Verz. 14. 1827.
Moraea viscaria var. *bituminosa* (L.f.) Baker, Flora Cap. 6: 15. 1896.

Plants 25–50 cm high, flexuously branched. *Corms* 1.5–2.0 cm in diameter; tunics dark brown, sticky and bituminous on the inner surfaces. *Leaves* 2, the lower basal, the upper attached to the lowest aerial node, linear, glabrous, falcate. *Stems* repeatedly branched, viscous below the nodes. *Spathes* herbaceous, becoming dry and conspicuously nerved with age, the apices obtuse, brown, occasionally lacerated, 2.5–4.0 cm long, subequal or the outer only slightly shorter. *Flowers* bright yellow; outer tepals 2–3 cm long, spreading or reflexed to ca. 45°; inner tepals 2–2.5 cm long, also reflexed. *Filaments* 5–7 mm long, free in the upper 1–2 mm; *anthers* 5–7 mm long. *Style branches* ca. 6 mm long, the crests to 8 mm, lanceolate. *Capsule* ovoid, 1.0–1.3 mm long; *seeds* angled. Chromosome number $2n = 20$.

Flowering time: October to mid December.

Distribution: Sandstone or shale slopes, mainly in the southwest, from Bredasdorp to Porterville.—FIG. 23.

Moraea bituminosa is typified by a Thunberg specimen, also illustrated in the *Dissertatio de Iride*, which is said to have been collected in the Twenty-four Rivers area south of Porterville. Both the coiled leaves and early flowering time (described as September by Thunberg) are unusual. Other features are, however, in keeping with the association of the large-flowered, bright yellow species of subgenus *Visciramosa*, from the southwestern Cape with the Thunberg collection.

It can readily be distinguished from its allies by its large flower with spreading to partially reflexed tepals and by the large obtuse spathes, 2.5–4 cm long. Confusion between *M. bituminosa* and *M. bubalina* is possible as the latter has equally large tepals and spathes. The spathes of *M. bubalina* are however distinctly acute and in addition this species, from the dry areas in the Clanwilliam-Van Rhynsdorp area, has dull buff- to khaki-colored flowers.

Moraea bituminosa is frequently found on sandy soils, but has been collected on the mixed clay-sand of lower mountain slopes. It is common on flats and slopes between Bredasdorp in the southeast and the Wellington-Tulbagh area to the north. The large clear yellow flowers open after midday and last until about sunset.

Though occasionally treated as a variety of *M. inconspicua* (as *M. viscaria*), (Baker, 1896), *M. bituminosa* is quite distinct morphologically and to a lesser extent ecologically from the other members of the subgenus *Visciramosa*.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Blinkwater Ravine, Cape Peninsula (CD), *Cassidy 72, 87* (both NBG). Lions Head, *Compton 12545* (NBG). Wynberg Hill, *Pillans 10354* (BR, MO). Above Bakoven, Camps Bay, *Barker 3234* (NBG).

33.19 (Worcester): Twenty-four Rivers (AA), *Thunberg s.n.* (UPS).

34.18 (Simonstown): Constantia Nek, Cape Peninsula (AB), *Goldblatt 392* (BOL). Bergvliet, Cape Peninsula, *Purcell s.n.* (BOL-16383). Chapmans Peak, *Compton 15398* (NBG). Dieprivier, Cape Peninsula, *Marloth 7210A, 7211* (both PRE). Buffels River, Hangklip (BD), *Barker 3918* (NBG). Disa Kloof, Bettys Bay, *Ebersohn s.n.* (NBG). Palmiet River mouth, *Barker 1342* (NBG).

34.19 (Caledon): Sandy slopes above Hermanus (AC), *Goldblatt 3325* (MO). Caledon (BA), *Penther 761* (S).

34.20 (Bredasdorp): Mountains above Bredasdorp (CA), *Barker 10853* (NBG).

24. **Moraea bubalina** Goldbl., sp. nov. TYPE: South Africa, Cape, Zandkraal, Van Rhynsdorp, *Barker 5667* (NBG, holotype).

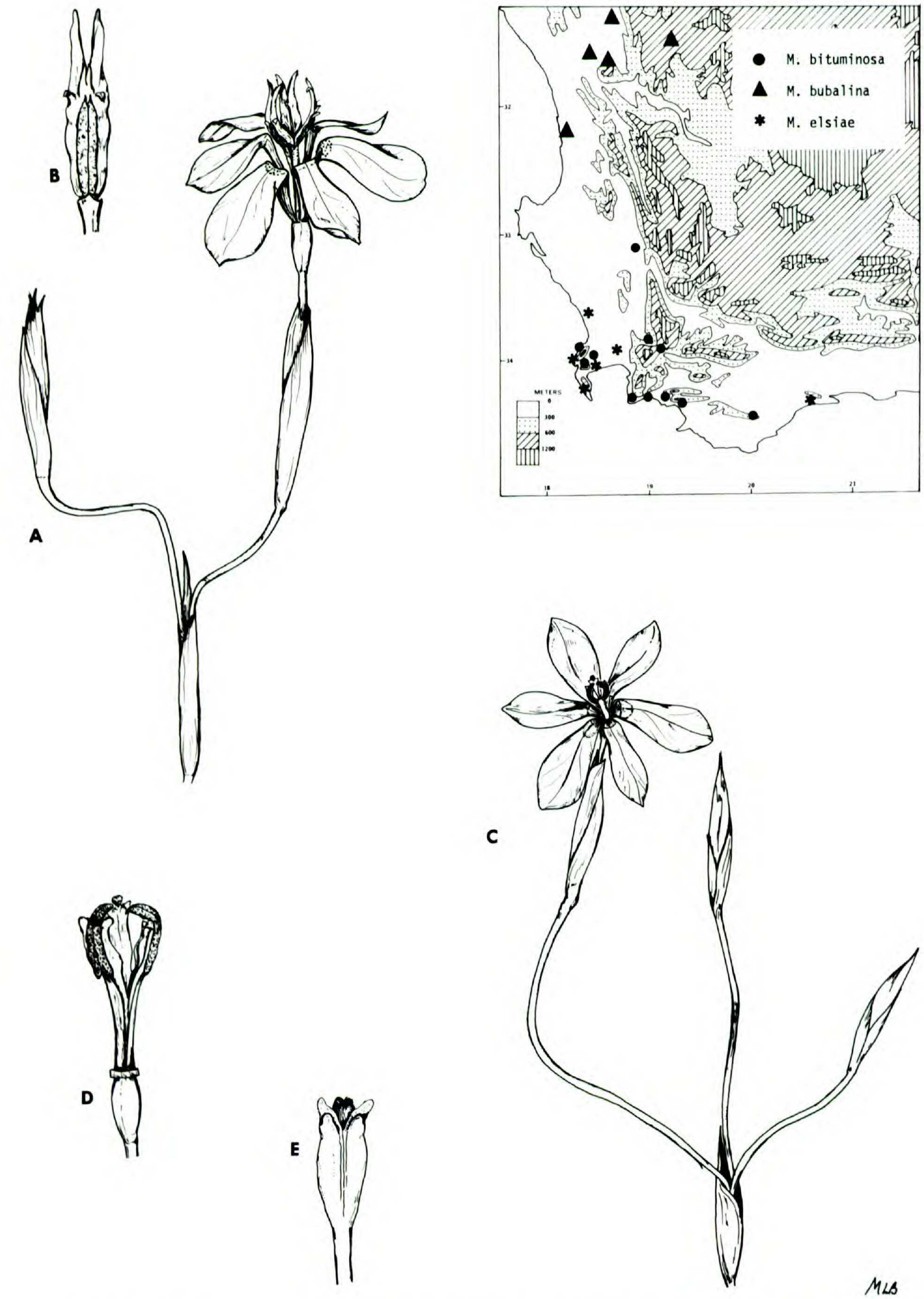

Figure 23. Distribution of *Moraea bituminosa*, *M. bubalina*, and *M. elsiae*, and floral morphology of *M. bituminosa* and *M. elsiae*.—A–B. *M. bituminosa*.—A. Flowering branch (life size).—B. Style branch and stamen (×2).—C–E. *M. elsiae*.—C. Flowering branch (life size).—D. Stamens and style branches (×4).—E. Style branch and stigma (×8).

Planta multiramosa, 20–45 cm alta, viscosa sub nodis. *Spathae* 2.8–3.6 cm longae, herbaceae, acutae. *Flores* bubalini ad pallidi-brunnei; tepala exteriora 2.2–2.8 cm longa, reflexa ad ca. 45°; tepala interiora breviora, reflexa. *Rami styli* producti.

Plants similar to *Moraea bituminosa* but frequently with more than 2 leaves. *Spathes* 2.8–3.6 cm long, herbaceous, acute. *Flowers* buff to light brown; outer tepals 2.2–2.8 cm long, reflexed to ca. 45°; inner tepals shorter, also reflexed. *Filaments* ca. 8 mm, free in the upper ⅓; *anthers* 4 mm long. *Style branches* ca. 7 mm long, crests 2–3 mm. *Capsule* not known. Chromosome number not known.

Flowering time: September to October.

Distribution: Clay gravel flats and slopes in the Calvinia, Clanwilliam, and Van Rhynsdorp districts.—FIG. 23.

Moraea bubalina is distinct in subgenus *Visciramosa* in having acute inflorescence spathes and frequently more than two leaves. The large buff to brown flowers and spathes exceeding 2.7 cm separate it from the more common *M. inconspicua* which occurs in the same area. In overall size it most resembles *M. bituminosa*, but the buff brown flowers, as well as the acute spathes, make any confusion between these two species unlikely.

Though it has seldom been collected, *M. bubalina* is more common than the record suggests, and I have observed it at several places in the Clanwilliam, Van Rhynsdorp, and Calvinia districts. The paucity of collections may be explained to some extent by the fact that flowers open only after midday and are inconspicuous owing to their dull color.

SOUTH AFRICA. CAPE: 31.18 (Van Rhynsdorp): Zandkraal (DA), *Barker 5667* (NBG). Wiedouw River, *Goldblatt 3075B* (MO).
31.19 (Calvinia): Plaatberg farm (DA), *Acocks 18613* (K, M, PRE).
32.18 (Clanwilliam): Near Lamberts Bay (AA), *Loubser s.n.* (BOL).

25. **Moraea viscaria** (L.f.) Ker, Ann. Bot. (König & Sims) 1: 240. 1805, as to name only, not to plant intended.—FIG. 24A–B.

Iris viscaria L.f., Suppl. Pl. 98. 1781. TYPE: South Africa, Cape, "Lospers farm," Saldanha district, *Thunberg s.n.* (Herb. Thunb. 1200, UPS, holotype).
Vieusseuxia viscaria (L.f.) Eckl., Top. Verz. 12. 1827.
Moraea odorata Lewis, J. S. African Bot. 7: 53. 1941. TYPE: South Africa, Cape, Rondebosch Common, *Barnard s.n.* (BOL-20341, holotype; PRE, SAM, isotypes).

Plants similar to *Moraea bituminosa* in habit, 20–45 cm high. *Spathes* 1.8–2.4 cm long. *Flowers* white, sometimes flushed with purple, sweetly scented; outer tepals 1.5–2.3 cm long, spreading to slightly reflexed; inner tepals 1.4–2.0 cm long. *Filaments* 5–6 mm, free near the apex only; *anthers* 4–5 mm long, acuminate, red. *Style branches* to 5 mm, the crests to 6 mm or occasionally reduced to 1 mm. *Capsule* broadly ovoid, 7–10 mm long. Chromosome number $2n = 20$.

Flowering time: Late September to October in the Saldanha area, elsewhere November to December.

Distribution: Sandy flats between Cape Agulhas in the east and Saldanha Bay in the north.—FIG. 24.

Though first described by the younger Linnaeus (who placed it in *Iris*), *Moraea viscaria* can only be identified from Thunberg's own description pub-

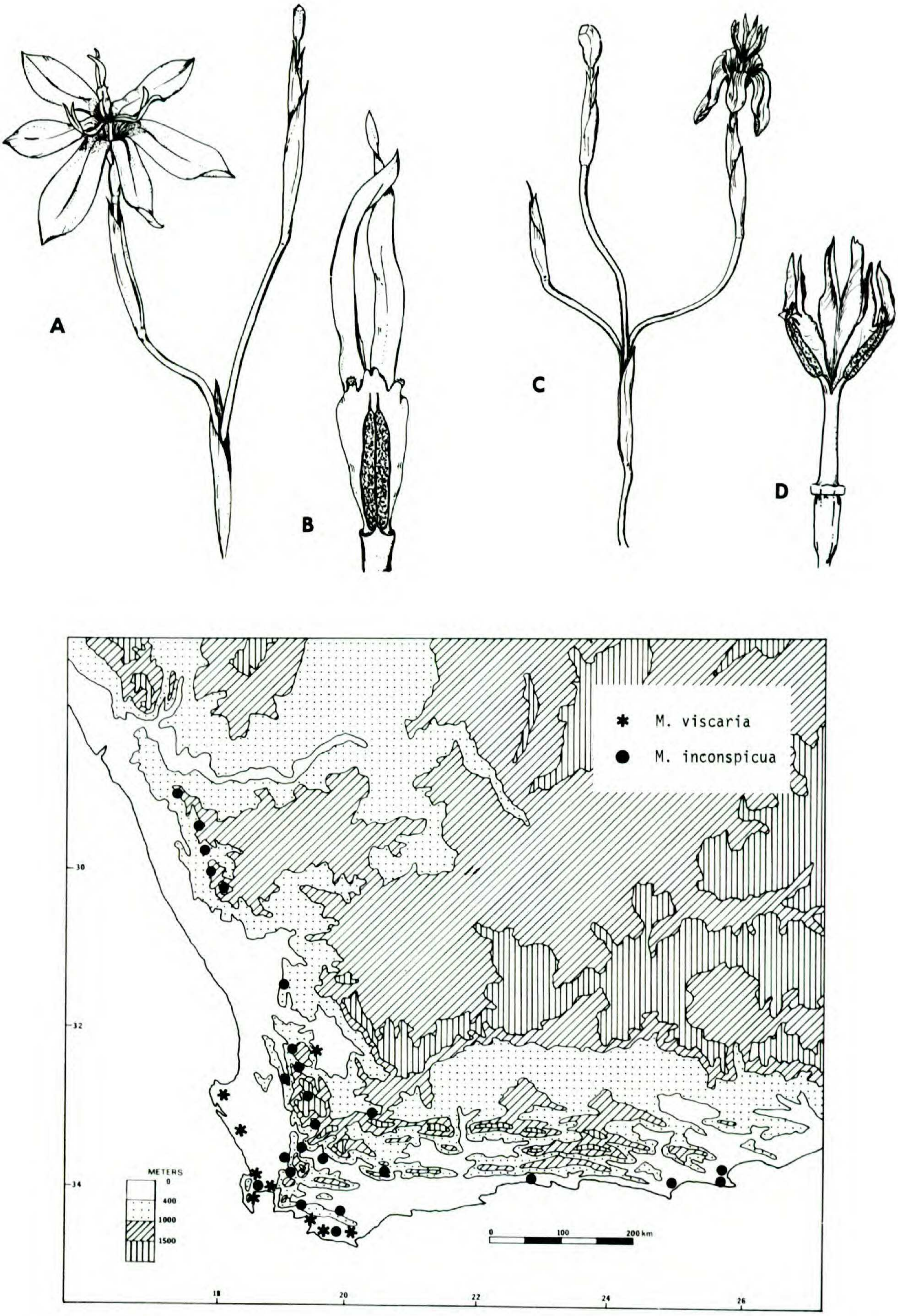

FIGURE 24. Distribution and floral morphology of *Moraea viscaria* and *M. inconspicua*. —A–B. *M. viscaria*.—A. Flowering branch (life size).—B. Style branch and anther (×4). —C–D. *M. inconspicua*.—C. Flowering branch (life size).—D. Stamens and style branches (×3).

lished a year later, and by his specimen collected in the Saldanha Bay district. Thunberg clearly described his plant as white flowered, flushed with purple, indicating that it is very likely conspecific with the plant described later by Lewis (in 1941) as *M. odorata*. After careful consideration of the description, it has become clear that the name *M. viscaria* must be applied to the white-flowered and usually scented plant which Lewis called *M. odorata*, and not to the small yellow- to brown-flowered species known by this name since Ker illustrated it in the *Botanical Magazine* in 1802.

This interpretation of the identity of *M. viscaria*, based on color, is supported by the recorded habitat—"in arenosis"—and, since the tepals are not described by Thunberg as reflexed, as for example in *M. bituminosa*, they are by inference spreading. Both facts are consistent with the belief that *M. viscaria* is conspecific with *M. odorata* and is not the same as the plant that has been associated with the name *M. odorata* since 1802. The latter, redescribed here as *M. inconspicua*, apparently always has strongly reflexed tepals and rarely grows in sandy situations. Moreover, *M. inconspicua* is not known from the Saldanha district, while specimens such as *Barker 8072*, previously assigned to *M. odorata*, do occur here.

Moraea viscaria has been recorded all along the southwestern Cape coast, from Saldanha in the north to Agulhas in the east. It invariably grows at low altitudes, often close to the sea, and in sandy soil. The white flowers open between 2 and 3 P.M. and last till evening. Most forms are very sweetly scented. Occasionally plants, and probably local populations, lack style crests and have, in general, *Homeria*-like flowers. These are not given taxonomic recognition as their characteristics are otherwise typical of *M. viscaria*.

The white color, scent, and outspread tepals all distinguish *M. viscaria* from its allies, *M. inconspicua* and *M. elsiae*, which also have small flowers and short inflorescence spathes.

SOUTH AFRICA. CAPE: 32.17 (Vredenburg): Granite outcrops near Vredenburg (DD), *Barker 8072* (NBG); *Lewis s.n.* (SAM-65685).

33.18 (Cape Town): Darling, flora reserve (AD), *Rycroft 2013* (NBG). Camp Ground, Cape Peninsula (CD), *Barnard s.n.* (BOL-20341, PRE, SAM). Milnerton, Cape Peninsula, *Salter 8705* (BOL, K, NBG, SAM).

34.18 (Simonstown): Cape Flats (BA), *Salter 8707* (SAM). Isoetes Vlei, *Barker 10592* (NBG, S, STE). Retreat, Cape Peninsula, (AB), *Salter 8724* (SAM), *4005* (K).

34.19 (Caledon): Near Hermanus (AC), *Loubser 2141* (NBG); *Leighton 365* (BOL, PRE). Onrust River, *Van Niekerk 304* (BOL). Hawston, *Schlechter 1615* (PRE). Near Elim (DA), *Barnard s.n.* (BOL). Ratelrivier, near Die Dam, *Goldblatt 478* (BOL). 10 km NE of Die Dam, *Acocks 23195* (PRE).

26. **Moraea inconspicua** Goldbl., sp. nov. TYPE: South Africa, Cape, Wilderness, *Van Niekerk 181* (BOL, holotype; PRE, isotype).—FIG. 24C–D.

Moraea viscaria sensu Ker, Bot. Mag. *tab.* 587. 1802; Baker, Fl. Cap. 6: 15. 1896, excl. vars; Lewis, Fl. Cape Pen. 229. 1950.

Planta multiramosa, 20–45 cm alta, viscosa sub nodis. *Spathae* 1.8–2.6 cm longae, herbaceae, obtusae, apicis brunneis. *Flores* flavi ad brunnei; tepala exteriora 1.3–1.8 cm longa, tota reflexa; tepala interiora similes sed breviores. *Filamenta* libera, contigua vel connata. *Rami styli* producti, cristae 3–6 mm longae.

Plants similar to *Moraea bituminosa*, 20–45 cm high. *Spathes* 1.8–2.6 cm long. *Flowers* yellow to brown; outer tepals 1.3–1.8 cm long, reflexed to 90° or more;

inner tepals 1.2–1.7 cm long, also reflexed. *Filaments* 5–6 mm long, free but contiguous, or united in part; *anthers* 3–4 mm long. *Style branches* ca. 5 mm long, the crests 3–6 mm long. *Capsule* broadly ovate, 7–10 mm long. Chromosome number $2n = 20$.

Flowering time: September to December (January).

Distribution: Throughout the winter rainfall area, usually in dry, exposed habitats.—FIG. 24.

Moraea inconspicua is one of the most widespread species in subgenus *Visciramosa* and is found throughout the Cape winter rainfall area from Namaqualand in the north to the Port Elizabeth district. Over this range it occurs in a variety of habitats: dry stony hills near Springbok to sandy soils in the sandveld, near Darling, to clay flats and slopes from the Caledon district eastwards. Flower color is variable with both brown and clear yellow being common, while white is also known. The leaves are usually straight and more or less erect, but plants from Namaqualand have characteristically spirally coiled leaves. *Moraea inconspicua* is distinguished by its short spathes, less than 2.6 cm long, and small flower, with completely reflexed tepals. A white form occurring in the Bidouw valley near Clanwilliam is tentatively assigned to *M. inconspicua*, though details of tepal orientation are not known.

Moraea inconspicua has been known since Ker described the plant illustrated in *Botanical Magazine* in 1803, but the name associated with it, *M. viscaria*, based on Thunberg and the younger Linnaeus's *Iris viscaria* is now believed to have been misapplied (see discussion under *M. viscaria*). *Iris viscaria* is here regarded as the earliest name for what has until now been called *M. odorata*, a white-flowered species with spreading tepals. The new name *M. inconspicua* is thus assigned to Ker's plant in this treatment.

SOUTH AFRICA. CAPE: 29.17 (Springbok): Steinkopf (BC), *Herre s.n.* (BOL). Hills E of Nababeep (DB), *Goldblatt 3054* (MO, NBG).

31.19 (Calvinia): Moist sandy places near Nieuwoudtville (AC), *Galpin s.n.* (BOL, K, PRE).

32.19 (Wuppertal): Juriesberg, Cedarberg (AC), *Bond 1400* (NBG). Middelberg, Cedarberg, *Esterhysen 7234* (BOL). Near Warmbaths, Olifants River valley (CC), *L. Bolus s.n.* (BOL-20322, K, PRE). Wagebooms River, Cold Bokkeveld, *Schlechter 10703* (GRA, K, PRE).

33.18 (Cape Town): Stellenbosch flats (DD), *Garside 1122* (K). Bottelary road, *Acocks 3672* (S).

33.19 (Worcester): Romans River (AC), *Bond 147* (NBG). Du Toit's Kloof (CA), *Esterhuysen 17761* (BOL, NBG, PRE). Karoo Garden, Worcester (CB), *Olivier 102* (PRE). French Hoek (CC), *Schlechter 9350* (BR, K, MO, PRE). Bethlehem farm, Pniel, *Wasserfall 716* (NBG); *Esterhuysen 9555* (BOL, PRE). Lower slopes, Naudesberg Koo (DA), *Lewis 5693* (NBG).

33.20 (Montagu): Cabidu, Laingsburg district, *Barker 6767* (NBG).

33.22 (Oudtshoorn): Wilderness (DC), *Van Niekerk 181* (BOL, PRE).

33.24 (Steytlerville): Near Gamtoos River (DD), *Barker 6903* (NBG).

33.25 (Port Elizabeth): Walmer, Port Elizabeth (DC), *Paterson 382* (BOL); *Bokelman 4* (NBG). Baakens River, *Long 484* (GRA, K, PRE).

34.18 (Simonstown): Dieprivier, Cape Peninsula (AB), *Marloth 7210, 7393* (PRE). Bergvliet, gravel soils, *Purcell s.n.* (SAM-90063-5).

34.19 (Caledon): Between Bot River and Hawston (AC), *Goldblatt 3300* (MO). Fairfield (BC), *Acocks 22929* (K, PRE). Near Elim, (DA), *H. Bolus s.n.* (BOL).

27. **Moraea elsiae** Goldbl., Ann. Missouri Bot. Gard. 63: 18. 1976, nom. nov. pro *Homeria simulans* Baker. TYPE: As for *H. simulans*.—FIG. 23C–E.

Homeria simulans Baker, Fl. Cap. 6: 529. 1896. TYPE: South Africa, Cape, sandy places near Kenilworth, *Bolus 7931* (BOL, lectotype; K, MO isolectotypes).

Plants similar to *Moraea bituminosa* in habit, 20–40 cm high. *Spathes* 1.9–3.0 cm long. *Flowers* bright yellow; tepals reflexed to ca. 45°. The outer 1.5–2.2 cm long, ca. 9 mm wide, the inner somewhat smaller, 1.4–1.9 cm long. *Filaments* 4–7 mm long, partly united; *anthers* 3–4 mm long. *Style branches* 3–4 mm long, the crests not produced. *Capsule* ovoid, to 1 cm long. Chromosome number $2n = 20$.

Flowering time: November to December (January).

Distribution: Cape Peninsula and vicinity east to the Bredasdorp district, usually on sandy flats.—FIG. 23.

Although *Moraea elsiae*, known until recently as *Homeria simulans*, has a flower typical of the genus *Homeria*, with reduced style branches which lack crests entirely, its vegetative structure is so strikingly like the species of *Moraea* subgenus *Visciramosa* that its close relationship with this alliance is self evident. The morphological similarities are fully confirmed by the cytology, *M. elsiae* having a diploid number of $2n = 20$ and a karyotype exactly like that in other members of subgenus *Visciramosa*. The karyotype in *Homeria*, on the other hand, is very different, with a base number of $x = 6$.

Homeria simulans was only recently transferred to *Moraea* (Goldblatt, 1976a) in which genus a new name was needed; the alternative, leaving this species in *Homeria* would have made this genus clearly polyphyletic, a quite unacceptable situation. The way in which the style in *M. elsiae* and in *Homeria* has been reduced is exactly the same, and must be regarded as an example of morphological convergence.

Moraea elsiae is relatively rare, though it has been found in several places on the Cape Peninsula. Its range extends across the Cape flats and further east with an isolated record from the Potteberg flats near Bredasdorp. It is very like its allies, *M. viscaria* and *M. inconspicua*, possessing spathes and flowers of a similar size. The absence of style crests and spreading to slightly reflexed tepals, distinguish it from *M. inconspicua*, while its yellow color and lack of scent distinguish it from those forms of *M. viscaria* which also lack style crests.

SOUTH AFRICA. CAPE: 33.18. (Cape Town): Between Mamre and Melkbos Strand (CB), *L. Bolus s.n.* (BOL-19970, K). Blinkwater, Cape Peninsula (CD), *Barker 7182* (NBG). Flats at Sherwood, Kenilworth, *H. Bolus 7931* (BOL, K, MO, PRE). Kenilworth racecourse *Esterhuysen 32358* (BOL). Langverwacht, Kuils River (DC), *Oliver 4793* (STE).

34.18 (Simonstown): Dieprivier, Cape Peninsula (AB), *Marloth 7211A, 7302* (both PRE). Near the railway at Retreat, Cape Peninsula, *Wolley Dod 3654* (BOL, K). Cirkels vlei, Cape Point Reserve, (AD), *Barker 3966* (NBG). Olifantsbosch, *Salter 2893* (BOL).

34.20 (Bredasdorp): Potteberg flats (BC), *Barker 8452* (NBG).

III. Subgenus MONOCEPHALAE

Subgenus **Monocephalae** (Baker) Goldbl. Ann. Missouri Bot. Gard. 63: 7. 1976. TYPE: *Moraea angusta* (Thunb.) Ker.

Moraea subgenus *Moraea* [sect.] *Monocephalae* Baker, Fl. Cap. 6: 11. 1896, pro parte.

Plants medium, unbranched. *Corm* tunics brown, soft textured, the inner layers ± entire, the outer fibrous. *Leaf* solitary, terete, inserted above ground level. *Stem* erect, the nodes often viscous. *Flowers* large, with erect or reflexed, entire inner tepals. *Ovary* distinctly 3-winged. *Capsule* clavate; *seeds* large, flat, discoid. Basic chromosome number $x = 10$.

Distribution: Southwestern Cape, extending as far north as Nieuwoudtville and as far east as Knysna.

Subgenus *Monocephalae* is a very isolated and morphologically distinct group in *Moraea*. While it has a basic chromosome number of $x = 10$, characteristic also of subgenus *Moraea*, it lacks the distinctive karyotype of large and very small chromosomes found in subgenus *Moraea*. The chromosomes grade from large to small with no sharp differences in size, a feature also of subgenus *Visciramosa*, which has a base number of $x = 10$, and possibly this is indicative of a mutual relationship. The differences between these two subgenera are, however, considerable and preclude the possibility of any close relationship between them. Similarities extend no further than the common characteristic of obtuse bracts and spathes and stickiness on parts of the stem, which is confined to the nodes in some species of subgenus *Monocephalae* while extending along the entire stem in subgenus *Visciramosa*. Differences between the two subgenera are more significant, with subgenus *Monocephalae* having a solitary leaf, unbranched axis, and flat discoid seeds, in contrast to the two or three leaves, the branched axis and small angled seeds of subgenus *Visciramosa*.

Similarity of the seeds of subgenus *Monocephalae* to those found in subgenus *Grandiflora* is striking and this character, as well as the unbranched axis and single leaf, led to Baker's belief that the two were closely related. Other morphological features are so different, that, together with cytology—subgenus *Grandiflora* having a base number of $x = 6$—it seems that the similarities are the result of convergent evolution.

The three species which are recognized in subgenus *Monocephalae* are very similar and consequently difficult to distinguish, and were in fact regarded as a single entity until quite recently.

28. **Moraea angusta** (Thunb.) Ker, Ann. Bot. (König & Sims) 1: 240. 1805; Baker, Fl. Cap. 6: 13. 1896, pro parte.—FIG. 25A–C.

Iris angusta Thunb., Diss. Irid., no. 28. 1782. TYPE: South Africa, Cape, slopes below Devils Peak and Lions Head, Cape Peninsula, *Thunberg s.n.* (Herb. Thunberg 1108, UPS, lectotype).

Moraea obtusa N.E. Br., Bull. Misc. Inform. 1931: 195. 1931. TYPE: South Africa, Cape, marsh at Crawford, Cape flats, *Weintraub sub Moss 18185* (K, BM).

Plants medium in size, 20–40 cm high, solitary, unbranched. *Corms* 1–2 cm in diameter; tunics pale to dark brown, soft textured, the innermost layers ± entire, the outer becoming vertically split, and eventually fibrous. *Leaf* solitary, inserted shortly above ground level, usually rigid and exceeding the inflorescence, terete. *Stem* erect, unbranched, bearing 1 or 2 bract leaves; nodes either smooth or viscous. *Spathes* herbaceous, dark green, the upper margins brown, usually truncate or obtuse at the apex; inner spathe 6–8 cm long, the outer ca. half the inner. *Flowers* pale yellow, translucent, occasionally pale grey blue, veined purplish below, the nectar guide clear yellow; outer tepals 3–5 cm long, the limb ca. ⅔ the claw; inner tepals 2.5–3.5 cm long, erect, often becoming reflexed at maturity. *Filaments* 5–12 mm long, free almost to the base (joined ca. 1 mm); *anthers* 7–10 mm, the pollen usually orange red, rarely yellow. *Style branches* 11–20 mm long, the crests 13–23 mm, equal or exceeding the style branch. *Capsules* cylindrical, somewhat 3-lobed, 1.5–2 cm long; *seeds* large, flat, disclike. Chromosome number $2n = 20$.

Flowering time: Late August to November.

Distribution: Flats and slopes often in sand, from the Cedarberg in the north to Knysna in the east.—FIG. 25.

Lewis (1949) decided, after careful examination of specimens assigned to *Moraea angusta*, that this actually comprised three species, and she accordingly recognized two new species, *M. neglecta* and *M. anomala.* Although I entertained considerable doubts about the validity of these segregated species, a detailed study of living populations and of herbarium material confirmed Lewis's treatment. In every living population encountered it has been easy to decide which of the three taxa was present, and no significant variability was found within any population. Carefully prepared herbarium specimens can also be readily determined, though in the absence of details of flower color and form, difficulties do arise that are not always fully resolved by measurement.

Important differences between *M. angusta* and its two close allies are given in Table 3. In the vegetative state accurate determination is often impossible and dry flowering material must be measured with care. Fresh flowering material is, however, easy to recognize by flower color and size, nature of the nectar guide, and pollen color. The only reliable characters in dried material are the relative lengths of the style branch and crests, and the degree to which the filaments are united. Both *M. angusta* and *M. neglecta* have filaments free almost to the base, while in *M. anomala* they are united for at least 2 mm and ¼–½ their length. The style crests are narrow and usually exceed a short style branch in *M. angusta* and *M. anomala*, while in *M. neglecta* the style branch is longer than the crest.

One of the difficulties in accepting the validity of all three species in section *Monocephalae* is the absence of any clear differences in geographic range. *Moraea neglecta* extends furthest north to Nieuwoudtville and eastwards as far as the Caledon district; *M. anomala* and *M. angusta* share the same range, extending in the north only to the Cedarberg, but somewhat further east than *M. neglecta* to Swellendam, with *M. angusta* being recorded as far as Knysna.

Habitat differences are also not very marked but the following differences are indicated. *Moraea anomala* is most frequently found on clay soils, notably the shale band of the Cedarberg and Du Toits Kloof Mountains. In contrast, *M. neglecta* is most often encountered on sandy flats, often near the coast. *Moraea angusta* is usually found on lower mountain slopes in a sandy or rocky soil. Though these habitats are not always clear cut, it seems likely that the three species do indeed have subtly different ecological preferences.

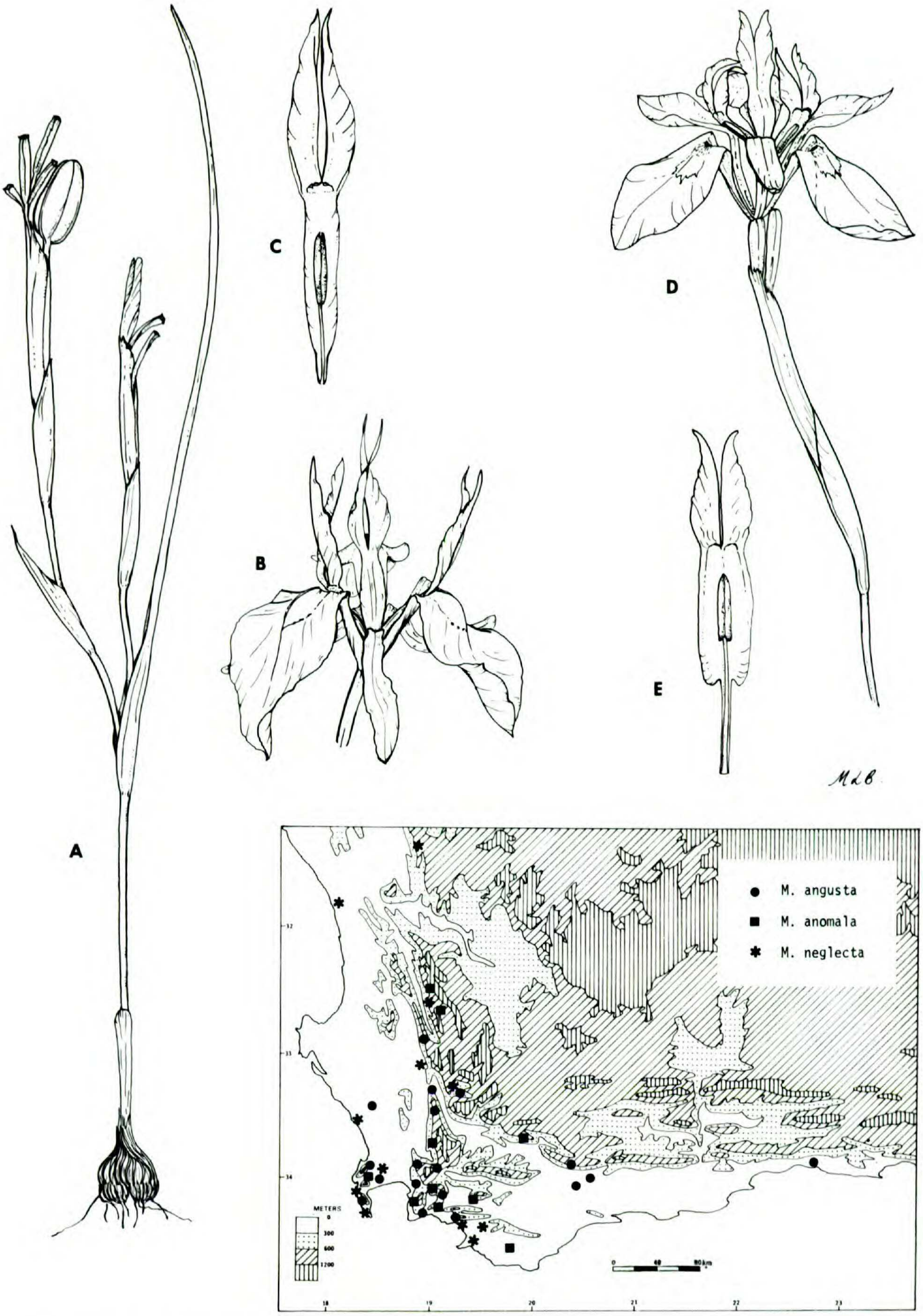

FIGURE 25. *Moraea* subgenus *Monocephalae*: distribution and morphology.—A–C. *M. angusta*.—A. Habit (×0.5).—B. Flower (life size).—C. Stamen and style branch (×1.5). —D–E. *M. anomala*.—D. Flower (life size).—E. Stamen and style branch (×1.5).

TABLE 3. Summary of morphological differences between *Moraea angusta*, *M. anomala* and *M. neglecta*.

Character	*M. angusta*	*M. neglecta*	*M. anomala*
Flower color	Pale translucent yellow, occasionally pale blue	Deep yellow	Pale yellow
Nectar guide	Clear deep yellow	Dotted black lines at the base of the limb	Clear deep yellow
Flower texture	Delicate	Firm	± delicate
Pollen color	Red	Yellow	Usually red
Node condition	Sticky or smooth	Sticky	Smooth
Sheathing leaf number	1 or 2	1	2
Ratio of style crest/style branch	1 or greater	1 or less	Varied
Union of filaments	Ca. 1 mm	Ca. 1 mm	2–7 mm (¼–½ the length)

SOUTH AFRICA. CAPE: 32.19 (Wuppertal): Porterville Mountains (CC), *Thompson 1480* (STE).

33.18 (Cape Town): Mamre Road, 45 km N of Cape Town (BC), *Barker 4096* (NBG). Block House, Camps Bay (CD), *Marloth 465* (PRE). Near Herbarium, Kirstenbosch, *Barker 4790* (NBG). Jakkals Vlei, Jonkershoek (DD), *Taylor 5476* (PRE).

33.19 (Worcester): Tulbagh waterfall (AC), *Schlechter 9005* (K, PRE). Base of mountains, Ceres (AD), *Marloth 6150* (PRE). Wolwekloof, Bains Kloof Mountains (CA), *Barker 4233* (NBG). French Hoek (CC), *Barker 4123* (NBG).

33.20 (Montagu): Below 10 O'Clock Peak (BD), *Wurts 443* (NBG).

34.18 (Simonstown): Suurdam, Cape Point Nature Reserve (AD), *Taylor 7354* (K, PRE, STE). Marsh, Crawford (BA), *Weintraub sub Moss 18185* (K). Sir Lowrys Pass (BB), *Goldblatt 3018* (MO, PRE); *Marloth 4564* (PRE).

34.19 (Caledon): Elgin (AA), *Johns s.n.* (NBG-58650). Top of Houw Hoek Pass, *Lewis 5315* (NBG); *Goldblatt 3292* (MO, NBG, PRE, S). Paardeberg, Palmiet River mouth (AC), *Grobler 77* (STE).

34.20 (Bredasdorp): Bontebok Park, Swellendam (AB), *Liebenberg 6587* (PRE). 7 km E of Swellendam (BA), *Mauve 4771* (PRE).

34.22 (Knysna): Bank of Knysna River above bridge (BB), *Galpin 4642* (K, PRE).

29. **Moraea anomala** Lewis, J. S. African Bot. 15: 119. 1949. TYPE: South Africa, Cape, Houw Hoek Pass, Caledon district, *Lewis s.n.* (SAM-58100, holotype).—FIG. 25D–E.

Plants similar to *Moraea angusta*. Stem bearing 2 bract leaves; nodes not viscous. *Spathes* 4.5–6 cm long. *Flowers* pale yellow with distinct darker nectar guide; outer tepals 3–4.5 cm long, the limb ± equal to the claw; inner tepals 2.5–3.5 cm long, erect, becoming reflexed at maturity. *Filaments* 6–14 mm long, united for at least 2 mm and usually ⅓–½ their length; *anthers* 4–8 mm long, the pollen usually red. *Style branches* 9–14 mm long, the crests ± equal in length or somewhat exceeding the branches, 10–15 mm long. *Capsule* and *seeds* as in *M. angusta*. Chromosome number $2n = 20$.

Flowering time: Late September to November.

Distribution: Mountains and flats, often on clay soil, from Cedarberg in the north to the Bredasdorp district in the south east.—FIG. 25.

The differences between *Moraea anomala* and its close allies *M. neglecta* and *M. angusta* are discussed in detail under the last mentioned species. *Moraea anomala* itself can usually be distinguished by its two bract leaves, smooth nodes, and pale yellow flower with filaments distinctly united for at least 2 mm and between ⅓ and ½ the total filament length.

Though the three species assigned to subgenus *Monocephalae* share the same geographical range, there are indications that each has slightly different habitat preferences. *Moraea anomala* is usually found on a clay substrate, either on flats or often on the upper shale band of the mountain ranges, notably in the Cedarberg and in the Du Toits Kloof Mountains. Most forms of *M. anomala* open in the late morning, and last till about 5:00 P.M. the same day. Strangely, the Cedarberg populations appear only to open at this time of the day and represent a fairly distinct form of this species.

SOUTH AFRICA. CAPE: 32.18 (Clanwilliam): Pakhuis Pass (BB), *Salter 1661* (K).

32.19 (Wuppertal): Top of Cedarberg Pass (AC), *Goldblatt 3252* (MO, NBG, PRE, S). Elands Kloof (CA), *Barker 3121* (NBG); *Lewis s.n.* (BOL-24394).

33.18 (Cape Town): Skeleton buttress, Kirstenbosch (CD), *Compton 16598* (STE).

33.19 (Worcester): Top of Du Toits Kloof Pass (CA), *Goldblatt 3201* (MO). Slopes of Naudesberg, Koo (DA) *Jessop s.n.* (NBG-58973).

34.18 (Simonstown): Hottentots Holland Mountains above Gordons Bay (BB), *Goldblatt 2988* (MO).

34.19 (Caledon): Lebanon Forest Reserve (AA), *Haynes 501* (PRE, STE); *Kruger 230* (PRE). Top of Houw Hoek Pass, *Gillett 875* (STE); *Lewis s.n.* (SAM-58100). Near Caledon (AB), *Schlechter 5528* (BR, PRE). 5 km W of Elim (DA), *Goldblatt 2616* (MO, PRE, NBG).

30. **Moraea neglecta** Lewis, J. S. African Bot. 15: 118. 1949. TYPE: South Africa, Cape, near Sirkels Vlei, Cape Peninsula, *Lewis s.n.* (SAM-57107, holotype).

Plants similar to *M. angusta*, often more robust. *Stem* bearing 1 bract leaf, rarely 2; nodes viscous. *Spathes* 5–7.5 cm long. *Flowers* deep yellow, the nectar guide lined with black dots; outer tepals 3.8–5 cm long, the limb 2–2.5 cm; inner tepals 2.5–3.5 cm long, usually erect, oblong. *Filaments* 6–12 mm long, united only at the base; *anthers* 7–9 mm long, the pollen yellow. *Style branches* 1.4–1.8 (–2.2) cm long, the crests 1.2–1.7(–2.2) cm, usually slightly shorter than the style branches. *Capsule* and *seed* as in *M. angusta*. Chromosome number $2n = 20$.

Flowering time: Mid September to November.

Distribution: Usually on flats, on sandy soils, from Niuewoudtville in the north to the Caledon district in the southwest.—FIG. 25.

Moraea neglecta is readily distinguished from its two close allies, *M. angusta* and *M. anomala*, when living by its distinctive dark yellow flower with a black dotted nectar guide. It can also be recognised by its usually sticky nodes, single bract leaf, and style crests which are usually slightly shorter than the style branches. Frequently the most robust of the three species, it occurs mainly on sandy flats near the coast between Stanford in the south and the Olifants River mouth, but is also recorded inland in the Cedarberg, and at Nieuwoudtville, its most northerly extention.

SOUTH AFRICA. CAPE: 31.18 (Van Rhynsdorp): 30 km SSW of Vredendal (CC), *Acocks 19710* (K, M, PRE, SRGH).

32.18 (Clanwilliam): Het Kruis, Piketberg (DA), *Stephens 8602* (K).

32.19 (Wuppertal): Slopes above Algeria, Cedarberg (AC), *Goldblatt 3256* (MO).

33.18 (Cape Town): Bok Point (CB), *Kies 170* (NBG). Near Mamre, *Barker 8151* (NBG). Sandy fields, Kenilworth (CD), *Bolus 3802* (BM, BOL, K, PRE). Flats at Rondebosch, *Wolley Dod 598* (BM, BOL, K). Camps Bay, *Cassidy 33* (NBG). Durbanville (DC), *Compton 16049* (NBG).

33.19 (Worcester): Saron (AA), *Schlechter 10659* (BM, BR, K, PRE, S). Schoongesig, Ceres (AD), *Hankekom 790* (K, PRE).

34.18 (Simonstown): W slopes, Red Hill (AB), *Hafstom & Acocks 324* (PRE). Kommetje, *Barker 5886* (NBG). Kalk Bay, above Boyes Drive, *Goldblatt 3122* (MO, NBG, PRE). Sirkels Vlei, Cape Point Nature Reserve (AD), *Taylor 8223* (STE); *Lewis s.n.* (K, SAM-57107). Olifantsbosch, *Compton 23709* (NBG). Klaasjagers' flats, *Barker 5903* (NBG, PRE).

34.19 (Caledon): Between Stanford and Hermanus (AD), *Goldblatt 2999* (MO, NBG, PRE). E of Stanford (BC), *Goldblatt 3007* (MO). Franche Kraal (CB), *Barker 8499* (NBG).

IV. Subgenus VIEUSSEUXIA

Subgenus **Vieusseuxia** (de la Roche) Baker, Handbook Irid. 48. 1892; Fl. Cap. 6: 12. 1896. TYPE: *Vieusseuxia spiralis* de la Roche = *Moraea bellendenii* (Sweet) N.E. Br.

Vieusseuxia de la Roche, Diss. Pl. Nov. 14. 1766.

Plants medium to small, simple to many branched. *Leaves* 5–1, solitary in most species. *Stem* produced above ground. *Flowers* unmodified to variously specialized with the inner tepals entire, tricuspidate, aristate or lacking. *Style branches* large with well-developed crests or, in a few species, much reduced to ± lacking. *Capsule* clavate to cylindrical; *seeds* small, angular or larger with inflated testa. Basic chromosome number $x = 6$.

Distribution: Southern, central and east Africa as far north as Sudan and Ethiopia.

This, the largest of the 5 subgenera of *Moraea*, comprises about 35 species, ranging in form from the large, many-branched multi-leafed *Moraea polystachya* to such specialized species as *M. villosa* and its allies with their often unbranched stems, single leaf, and gorgeously colored flowers with characteristic tricuspidate inner tepals. The chromosome number is based on $x = 6$ throughout the subgenus, and only a few polyploid species are known.

Subgenus *Vieusseuxia* is believed to have evolved from subgenus *Moraea* or an immediate ancestor (Goldblatt, 1976a) with species like *M. polystachya* and *M. polyanthos*, the most primitive in the subgenus, bridging the gap between the multi-leafed, many-branched ancestral habit and the single leaf and simple or few-branched habit of the majority of species in the subgenus.

Section 6. **Polyanthes** Goldbl., Ann. Missouri Bot. Gard. 63: 8. 1976. TYPE: *Moraea polystachya* (L.f.) Ker.

Plants medium to small, few to many branched. *Leaves* 5–3 or solitary. *Flowers* blue purple; inner tepals entire, spreading or erect. *Style branches* and crests well developed. *Capsule* spherical-clavate; *seeds* small, angled. Basic chromosome number $x = 6$.

Distribution: Southern Cape, the karoo, South West Africa, through the central and east African highlands to Sudan and Ethiopia.

Section *Polyanthes* is a natural alliance comprising species ranging from the several-leafed, much-branched forms such as *Moraea polystachya* and *M. polyanthos* to fewer-branched species including amongst others, *M. carsonii* Baker with only two leaves, in tropical Africa, and the single leafed *M. elliotii* Baker and *M. stricta* Baker from southern Africa. Though most of the approximately ten species in the section occur in summer rainfall regions of Africa, the putatively more primitive multi-leaved species occur in the south in the karoo and southern Cape.

31. **Moraea polystachya** (L.f.) Ker

This widespread species occurs predominantly in the summer rainfall area and it was treated fully in the revision of *Moraea* for this area (Goldblatt, 1973: 217). It occurs primarily in South Africa in the Great Karoo and eastern Cape and extends not only into South West Africa, Botswana, and the northern Cape, but also into the Little Karoo, an area recognized as part of the winter rainfall region. Field observations have indicated that the populations occurring in the Little Karoo are distinctive and comprise what may be regarded as a geographical race. The populations in the Little Karoo have paler blue flowers than the typical form, erect inner tepals, and lack the characteristic red venation of the ovary found in plants occurring outside this area. The Little Karoo populations are also later blooming, from June to August, while the typical flowering period of plants in the summer rainfall region is April and May occasionally extending to early July.

32. **Moraea polyanthos** L.f., Suppl. Pl. 99. 1781; Baker, Fl. Cap. 6: 16. 1896. TYPE: South Africa, Cape, Kore R. region, *Thunberg s.n.* (Herb. Thunb. 1127, UPS, holotype).—FIG. 26A–B.

M. bipartita L. Bolus, J. Bot. 71: 122. 1933. TYPE: South Africa, Cape, Riversdale Karoo, on road to Adams Kraal, *Ferguson s.n.* (BOL-20068, holotype).

Plants (10–)20–30 cm high, occasionally reaching 40 cm, usually much branched. *Corms* ca. 1.5 cm in diameter; tunics of dark brown to black fibers. *Leaves* usually 3, occasionally 2 or 4, linear, 2–6 mm wide, glabrous, the lower basal and usually exceeding the inflorescence, the upper shorter. *Stem* glabrous, branching repeatedly. *Spathes* herbaceous or becoming dry above, the apex attenuate, dark brown; inner spathe (2)2.5–4.5 cm long, the outer ca. half the length of the inner. *Flowers* pale blue; outer tepals (1.6–)2–3 cm long, lanceolate, the limb reflexed to 45°, ca. equal the claw; inner tepals smaller, 1.4–2.5 cm long, lanceolate, also reflexed. *Filaments* 4–6 mm long, free in the upper 1–2 mm; *anthers* ca. 5 mm long. *Style branches* ca. 5 mm long, the crests 5–8 mm. *Capsule* oblong to broadly ovate, ca. 9 mm long; *seeds* angled. Chromosome number $2n = 12$.

Flowering time: (June to) August to October (to November); flowers opening after midday and fading between 5:30 and 6:00 P.M.

Distribution: Common in the Little Karoo, also occasional in dry situations in the southern Cape as far east as Uitenhage.—FIG. 26.

Moraea polyanthos is closely allied to the widespread karoo and eastern Cape, autumn-flowering species, *M. polystachya*, and the two are easily confused. *Moraea polystachya* is however a more robust species and is larger in most features and consistently so in the floral parts. In contrast to *M. polyanthos* which is spring blooming, usually from August to October, *M. polystachya* flowers in the autumn, typically from March to June, but later, in July and August, in the Little Karoo. Though the two species both grow in the Little Karoo and in similar situations, differences in flowering periods appear to isolate them reproductively, with *M. polyanthos* usually blooming several weeks later than *M. polystachya* in the same localities.

Moraea bipartita appears to be no more than a small depauperate form of *M. polyanthos* and is here reduced to synonymy. Its distinguishing feature, the stigma, which instead of being a continuous lip above the anther is divided into two separate lobes, is not unique or even unusual in *Moraea* and is not taxonomically significant, as many forms of *M. polyanthos* also exhibit this feature. Though *M. bipartita* is described as having only two leaves, one of the two specimens of the type collection actually has three leaves, the number most common in *M. polyanthos*.

Moraea polyanthos was first collected by Thunberg whose manuscript name the younger Linnaeus used when describing the species. Both Thunberg and the younger Linnaeus used the name *Iris* for species of *Moraea*, but for some reason *M. polyanthos* was considered a *Moraea*, a genus in their estimation comprising plants with spreading subequal tepals and slender style branches. Apparently the latter were overlooked or not considered significant in this case, for the type of *M. polyanthos* is certainly a true *Moraea*.

SOUTH AFRICA. CAPE: 32.24 (Graaff Reinet): Near Graaff Reinet (BC), *H. Bolus 522* (BOL, K, S).

33.20 (Montagu): Bonnievale (CC), *Marloth 11821* (PRE). Barrydale (DC), *Bayliss 1674* (PRE).

33.21 (Ladismith): Seven Weeks Poort (AD), *Thorne s.n.* (NBG); *Compton 7475* (BOL, NBG); *Goldblatt 661* (BOL); Hoeko road, Ladismith, *Wurts 1117* (NBG). 9 km E of Amalienstein (BC), *Acocks 15300* (PRE).

33.22 (Oudtshoorn): Doornkraal, de Rust (BC), *Dahlstrand 2171* (PRE). Near Ruitersbos (CC), *Salter 3268* (BOL, K).

33.23 (Willowmore): Willowmore (AD), *Bayliss 3615* (NBG). Baviaanskloof (BC), *Bayliss 3619* (NBG). Uniondale (CA), *Paterson 3089* (GRA). Haarlem (CB), *Schonland 3108* (GRA).

33.24 (Steytlerville): Hankey (DD), *Paterson 1* (GRA); *Fourcade 3313* (BOL, K, NBG).

33.25 (Port Elizabeth): Enon (BC), *Thode A2760* (PRE). Uitenhage (CD), *Loubser 904* (NBG); *Dahlstrand 327* (GRA); *Paterson 1164* (GRA). Addo (DA), *Long 1094* (GRA, K, PRE). Port Elizabeth (DA), *Fries et al. 623* (K, PRE, S); *Drège 289* (GRA).

34.21 (Riversdale): Corente River, Riversdale dist. (AA), *Muir 5352* (PRE). Near Gouritz R. bridge (BA), *Mauve 4601* (PRE).

34.22 (Mossel Bay): Hartenbos R., Mossel Bay (AA), *Immelman 91* (PRE). Near Great Brak R., *Young 5542* (BOL).

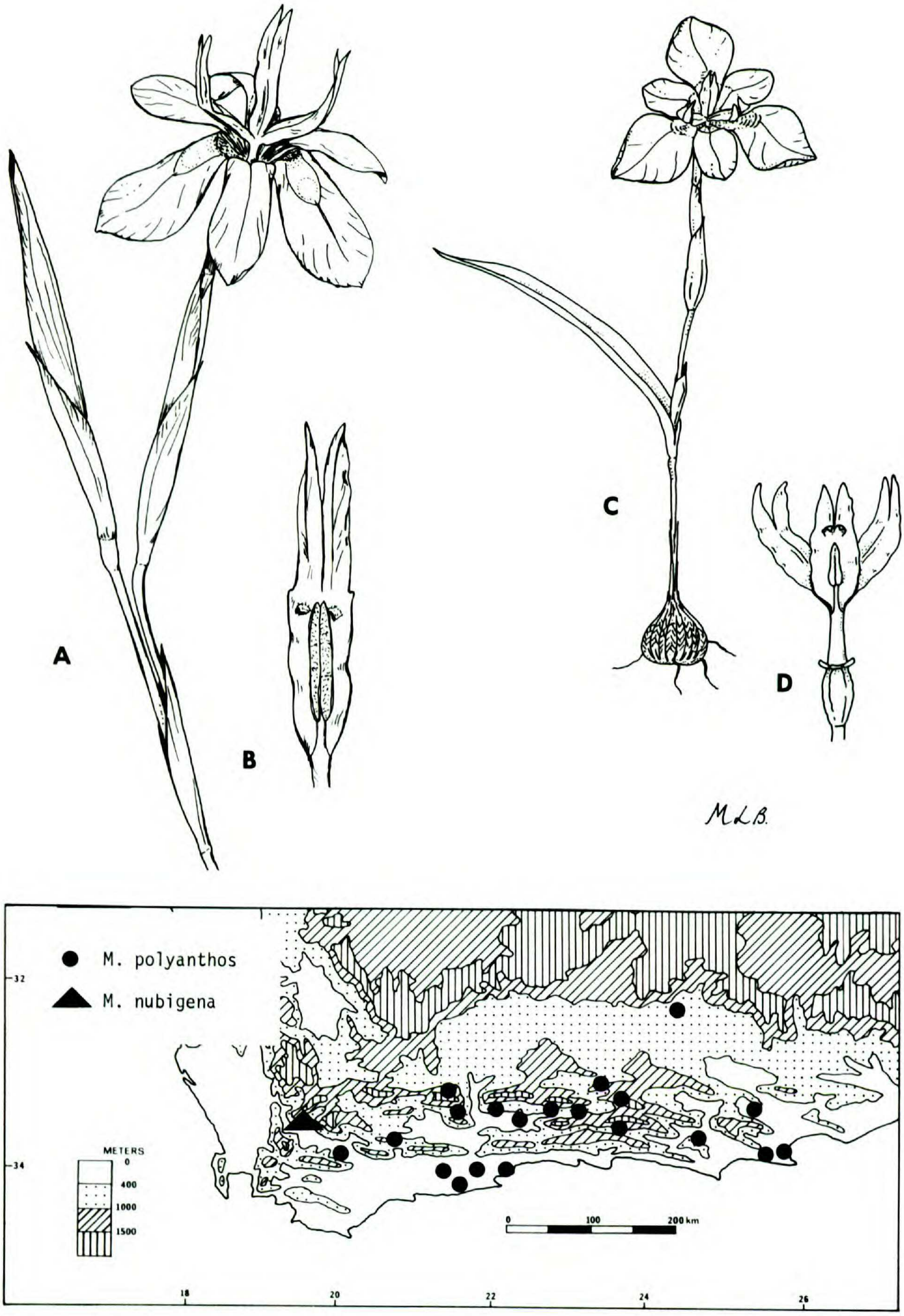

FIGURE 26. Morphology and distribution of *Moraea polyanthos* and *M. nubigena*.—A–B. *M. polyanthos*.—A. Flower (× 1.5).—B. Style branch and anther (× 2).—C–D. *M. nubigena*.—C. Whole plant (× 1.5).—D. Gynoecium and androecium (× 2.5).

33. **Moraea nubigena** Goldbl., sp. nov. TYPE: South Africa, Cape, Worcester district, near Fonteintjiesberg hut at 1,400 m, *Goldblatt 4208* (MO, holotype; K, NBG, PRE, S, isotypes).—FIG. 26C–D.

Planta parva, 3–5 cm alta. *Folium* unum, basale, falcatum, canaliculatum, 3–4 cm longum. *Caulis* simplex. *Spatha* herbacea, interiora 1.2–1.4 cm longa, exteriora breviora. *Flores* 2(–3), atrocaerulei, luteo punctati; tepala exteriora 10–14 mm longa, limbo reflexo; tepala interiora 8–10 mm longa, reflexa. *Filamenta* ca. 3 mm longa, *antherae* 1.5–2 mm longa. *Rami styli* lati, ca. 3 mm longi, cristae ad 2 mm.

Plants very small, 3–5 cm high at flowering time. *Corm* to 1 cm in diameter, spherical, thickly covered with finely reticulate tunics. *Leaf solitary*, inserted at ground level, somewhat succulent, falcate, channelled, 3–4 cm long. *Stem* simple, 2 internodes long with a node and a short bract near the base. *Spathes* herbaceous, often red flushed; inner spathe 1.2–1.4 cm long, the outer ca. ⅔ the inner. *Flowers* 2(–3), deep blue, the nectar guide small, yellow; outer tepals longer than the inner, 1.0–1.4 cm long, the limb 6–8 mm long; flexed sharply 30°–45°, striped; inner tepals 8–10 mm long, the limb also sharply reflexed. *Filaments* ca. 3 mm long, free in the upper third; *anthers* 1.5–2 mm long. *Style branches* 3 mm long, the *crests* to 2 mm. *Capsule* and *seeds* not known. Chromosome number unknown.

Flowering time: Late September.

Distribution: Known only from Fonteintjiesberg in the Worcester district, growing on wet moss-covered rocks at 1,400 m.—FIG. 26.

Moraea nubigena was apparently first gathered in 1925 by the well-known collector of Cape mountain flora, T. P. Stokoe, who gave to Rudolf Marloth two fruiting specimens, now preserved at the National Herbarium in Pretoria. Though not possible to assign to genus, these plants clearly were related to the *Moraea-Homeria* alliance. The locality of the original gathering, the Brandwacht Mountains, was accordingly visited in September 1976, and a population was located on Fonteintjiesberg, adjacent to Brandwacht Mountain, only very locally at about 1,400 m near the mountain club hut.

The species is remarkable in the genus for its size, by far the smallest *Moraea*, and also for its habitat. It grows on moist rock flushes in banks of moss where the very shallow soil inhibits the growth of larger plants. In spite of its specialized habitat and vegetative morphology, the flower itself is quite typical of *Moraea* and not at all modified. It is somewhat tentatively assigned to subgenus *Vieusseuxia* on account of its unbranched habit, and to section *Polyanthes* where its flower is quite typical. Chromosome studies are needed to confirm its affinities.

SOUTH AFRICA. CAPE: 33.19 (Worcester): Brandwacht Mountains (CD), *Stokoe s.n.* (PRE). Fonteintjiesberg, near mountain club hut, on rock flushes, *Goldblatt 4091* (MO), *4208* (K, MO, NBG, PRE, S).

Section 7. **Vieusseuxia**. TYPE: *Vieusseuxia spiralis* de la Roche = *Moraea bellendenii* (Sweet) N.E. Br.

Plants medium to small. Stem simple to several branched. *Leaves* solitary, rarely with a smaller second leaf. *Flowers* variable; inner tepals entire, tricuspidate, aristate or lacking; outer tepals often with conspicuously colored nectar guides. *Capsules* clavate to cylindrical; *seeds* small, angled, or larger with a spongy testa. Basic chromosome number $x = 6$.

Distribution: Throughout the winter rainfall area and extending north through Natal to the northern Transvaal.

Several natural groups of species can be discerned in this large section of approximately 25 species, but they are closely linked to one another through intermediates, making it difficult to recognize subordinate taxa. The dividing line between section *Vieusseuxia* and section *Polyanthes* is itself rather arbitrary with *Moraea algoensis* and *M. elliotii* being fairly closely related and linking the two sections.

There are three major alliances within section *Vieusseuxia*: *M. tripetala* and its allies form one group; *M. tricuspidata* and *M. unguiculata* and their allies a second; while the so called "peacock moraeas," *M. villosa* and allied species a third. Species like *M. thomasiae* and *M. barkerae*, both with entire inner tepals, are difficult to place and probably represent isolated entities within the section.

Section *Vieusseuxia* contains some of the most advanced species in the genus, and the section as a whole is characterized by a variety of floral specializations, while the vegetative morphology is fairly constant. The center of evolution for the section is probably the southwestern Cape winter rainfall area, but a fair representation of species occurs in the summer rainfall highlands of South Africa.

34. **Moraea algoensis** Goldbl., Ann. Missouri Bot. Gard. 60: 226. 1973. TYPE: South Africa, Cape, Port Elizabeth, *Batten 7* (NBG, holotype).—FIG. 28A.

Plants 20–40 cm high. *Corm* 1–1.5 cm in diameter; coarse tunics often extending upward. *Leaf* linear, inserted near ground level, canaliculate, 2–3 mm wide, exceeding the inflorescence. *Scape* branched, the branches 2–4, held away from the axis, often secund; bract leaves to 4 cm long, dry and brown in the upper part with long, tapering apices. *Spathes* herbaceous with dry apices; inner spathe 4–5 cm long, the outer ca. half the length of the inner. *Flowers* dark blue with yellow nectar guides; outer tepals to 3.0 cm long, the limb ca. 2.0 cm long and ca. 0.9 cm broad; inner tepals blue or brown, comparatively short, 6–10 mm long, reaching to about the level of the stigmas, often distinctly unguiculate with an expanded limb to 2.5 mm broad, entire or occasionally 3-lobed. *Filaments* 3.5–7 mm long, usually free in the upper third; *anthers* 4–7 mm, not reaching the stigmas, pollen orange yellow. *Style branches* 5–8 mm long, the crests linear, up to 8 mm long. *Capsule* clavate, to 1.2 cm long; *seeds* angled. Chromosome number $2n = 12$.

Flowering time: July to September.

Distribution: Southern Cape between Worcester and Port Elizabeth.—FIG. 27.

When first described (Goldblatt, 1973), *Moraea algoensis* was believed to occur mainly in the Port Elizabeth-Humansdorp region, with a westerly extension to the upper Long Kloof near Avontuur. It was consequently regarded as a species from the summer rainfall area of South Africa, Port Elizabeth being a borderline region. It has subsequently become clear that the Port Elizabeth populations are an easterly extension of a truly winter rainfall area species and it has been collected further west on the Wildehondekloof Pass between Barrydale and Montagu and at the Karoo Garden near Worcester. The Wildehondekloof record *Goldblatt 2840* is of particular interest as *M. tripetala*, a closely related species, was found at the same site. The two species flower at the same time and are superficially similar, but the expanded, though short, inner tepals and well-developed style and united filaments of *M. algoensis* stand in marked contrast to the vestigial inner tepals and almost free filaments and short style, which branches near the base, in *M. tripetala.*

Moraea algoensis appears to represent a link between section *Polyanthes* and section *Vieusseuxia*, with species like *M. elliotii* and *M. carsonii* of the former section being very closely allied to *M. algoensis*, which in turn is related to *M. tripetala.* The inclusion of *M. algoensis* in section *Vieusseuxia* is thus almost arbitrary, though it is placed here because of its small, unusually shaped inner tepals which appear to represent an early step in the reduction of this organ.

SOUTH AFRICA. CAPE: 33.19 (Worcester): Karoo Garden, Worcester (CB), *Olivier 138* (STE).

33.20 (Montagu): Wildehondekloof Pass, W of Barrydale, Little Karoo (DC), *Goldblatt 2840* (K, MO, NBG, PRE).

33.23 (Willowmore): Between Knysna and Avontuur (CC), *Fries et al. 1790* (SAM). Prince Alfred Pass, *Wall s.n.* (S).

33.24 (Steytlerville): Assegaibosch (CD), *Fourcade 1427* (K, BOL). Zuuranys Pass, N. Kareedouw, *Oliver 4438* (STE). 70 km W of Port Elizabeth (DD), *Story 2834* (PRE).

33.25 (Port Elizabeth): Van Stadens Mts. (CC), *Oliver 4472* (STE). Witteklip flats, *Holland s.n.* (BOL-30812); *Long 652* (PRE). Port Elizabeth (DC), *Hafstrom & Acocks s.n.* (PRE-31513). Redhouse, *Paterson 439* (BOL). Near Port Elizabeth, *West 311* (BOL); *Batten 7* (NBG).

34.24 (Humansdorp): Humansdorp (BB), *Loubser 880* (NBG); *Galpin 4646* (K, PRE).

35. **Moraea tripetala** (L.f.) Ker, Bot. Mag. *tab. 702.* 1802; Baker, Fl. Cap. 6: 23. 1896, incl. var.—FIG. 28B.

Iris tripetala L.f., Suppl. Pl. 97. 1786. TYPE: South Africa, Cape, hills near Cape Town, near Piketberg, etc., *Thunberg s.n.* (Herb. Thunb. 1186, UPS, lectotype).

Vieusseuxia tripetala (L.f.) Klatt, Durand & Schinz, Consp. Fl. Afr. 5: 155. 1895.

Moraea tripetala var. *jacquinii* Schlecht. ex Lewis, J. S. African Bot. 7: 54. 1941. TYPE: South Africa, Cape, Constantiaberg, *Wolley Dod 1919* (BOL, lectotype).

Vieusseuxia tripetaloides DC., Ann. Mus. Natl. Hist. Nat. 2: 138. 1803, nom. illeg., superfl. pro *Iris tripetala* L.f.

Iris mutila Licht. ex R. & S., Syst. Veg. 1: 477. 1817. TYPE: South Africa, Cape, Lions Head, *Lichtenstein s.n.* (Location of specimen unknown).

Moraea tripetala var. *mutila* (Licht. ex R. & S.) Baker, Fl. Cap. 6: 23. 1896.

Vieusseuxia pulchra Eckl., Top. Verz. 13. 1827. TYPE: South Africa, Cape, "Hottentotskloof," *Ecklon & Zeyher s.n.* (S, lectotype).

V. mutila C. H. Berg ex Eckl., Top. Verz. 12. 1827. TYPE: South Africa, Cape, Camps Bay *Berg s.n.* (S, lectotype).

Moraea punctata Baker, Bull. Herb. Boissier, sér. 2, 4: 1003. 1904. TYPE: South Africa, Cape, Gouda (as Piketberg Road), *Schlechter 4851* (K, lectotype; B, PRE, isotypes).

M. monophylla Baker, Bull. Misc. Inform. 1906: 24. 1906. TYPE: South Africa, Cape, Olifants Rivier, *Penther 685* (K, lectotype), *626* (K, syntype).

M. amabilis Diels, Bot. Jahrb. Syst. 44: 118. 1910. TYPE: South Africa, Cape, "Bokkeveld, Oorlogs Kloof," Calvinia, *Diels 626* (B, lectotype).

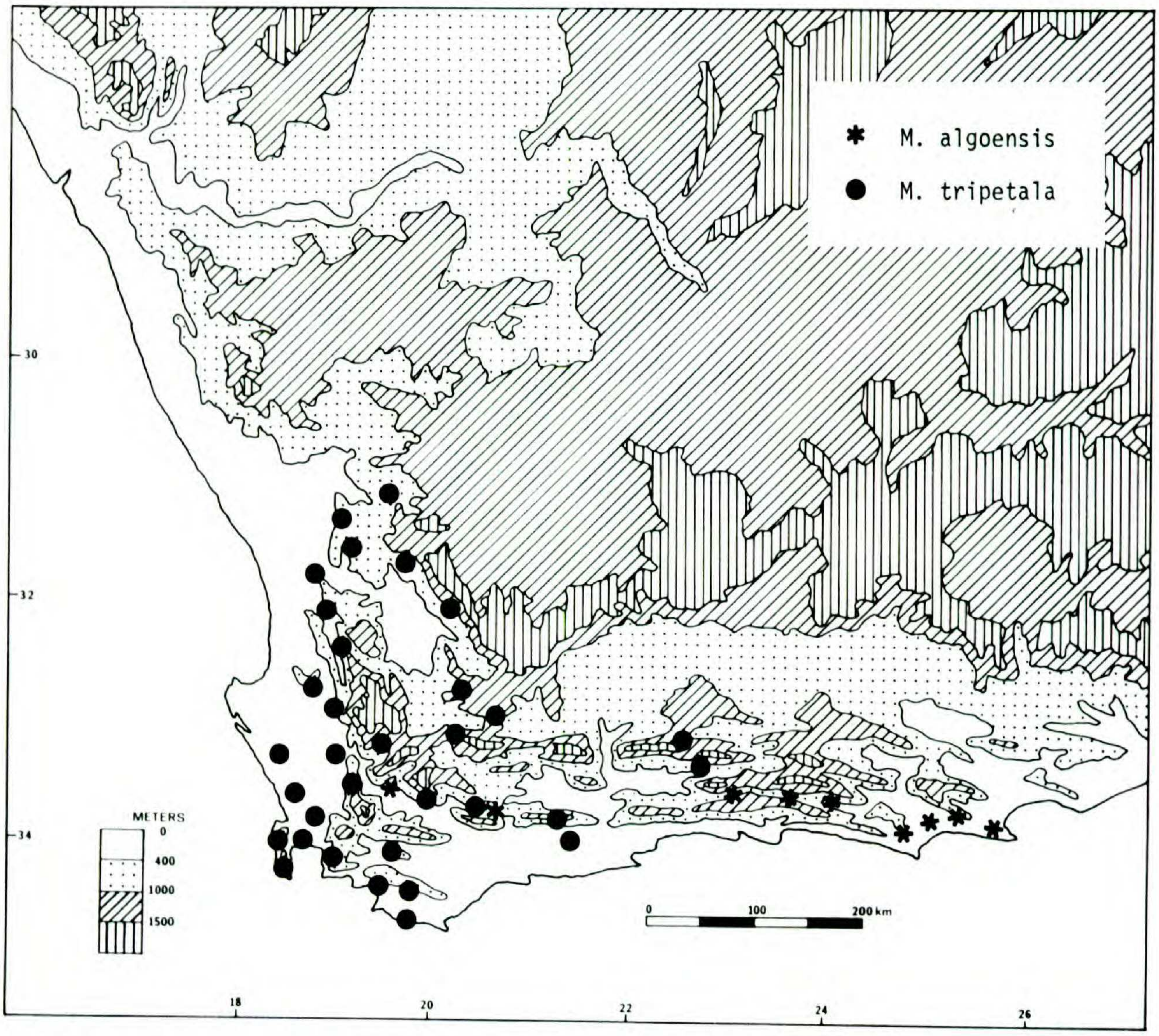

FIGURE 27. Distribution of *Moraea algoensis* and *M. tripetala*.

Plants 10–50 cm high, simple or few branched. *Corm* 1–2 cm in diameter; tunics pale to dark grey, fine to coarsely fibrous. *Leaf* solitary or rarely 2, basal, canaliculate, linear or ensiform, glabrous or pubescent. *Stem* simple or with divergent branches. *Spathes* herbaceous, with dark brown attenuate apices; inner spathe 3.5–7 cm long, the outer ca. half the inner. *Flower* pale to dark blue, or pale pink, the nectar guide white to yellow; outer tepals lanceolate, 2–3.5 cm long, the claw to 1.5 cm long, bearded and often spotted, the limb spreading to somewhat reflexed; inner tepals inconspicuous, rarely tricuspidate with a longer central cusp, usually filiform or ciliate, occasionally absent. *Filaments* 4–6 mm long, joined at the base only; *anthers* 4–8 mm long, the pollen usually red. *Style branches* 7–10 mm long, the crests 5–15 cm long, linear-lanceolate. *Capsule* clavate, 1.3–1.6 cm long; *seeds* small, angular. Chromosome number $2n = 12$.

Flowering time: August to December, latest at high altitudes.

Distribution: Southwestern Cape from Nieuwoudtville in the north to Riversdale in the east, occurring both on clay and sandy soils.—FIG. 27.

The extremely variable *Moraea tripetala* is treated here as a single aggregate species and no subspecific taxa are recognized. All forms share in common the

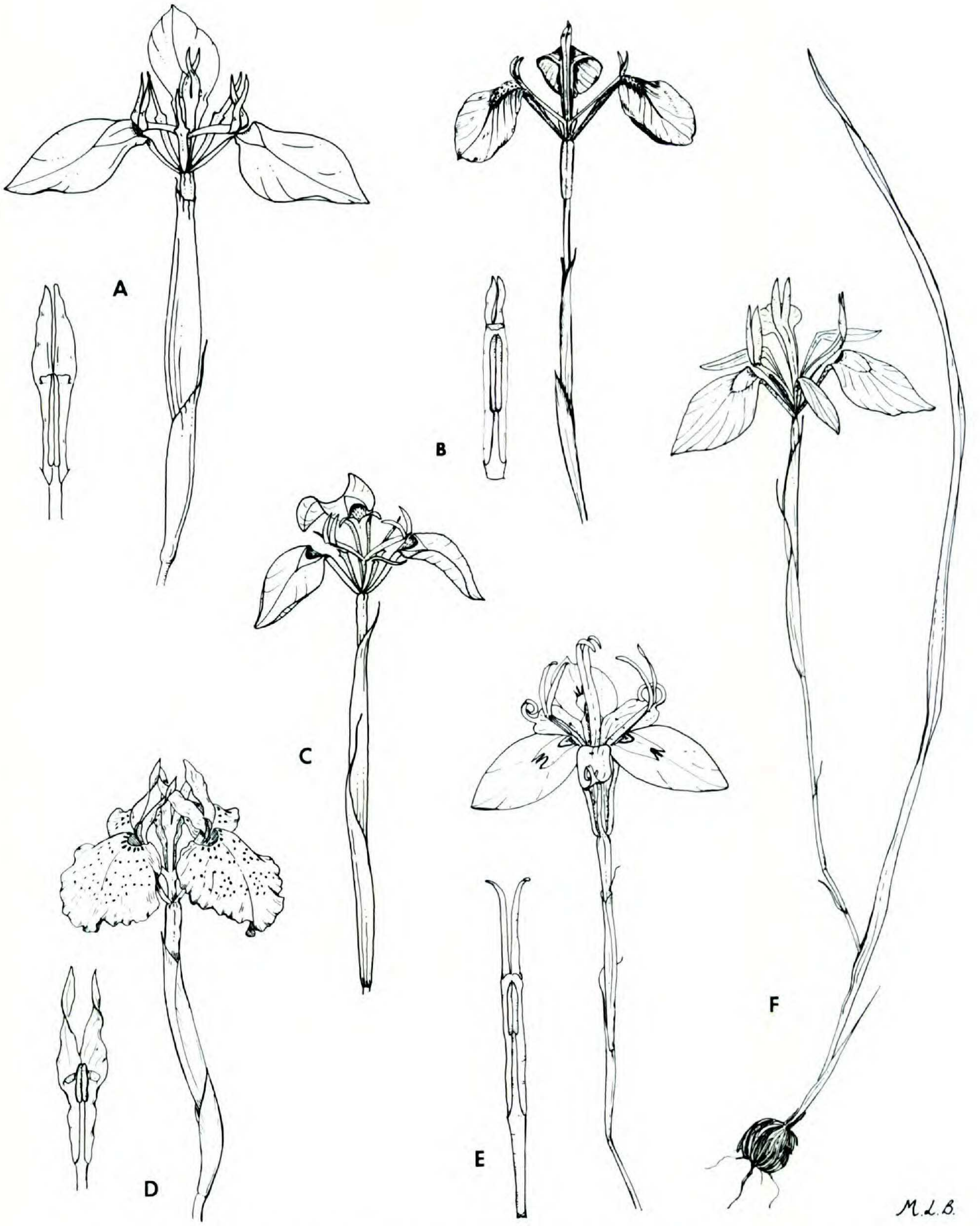

FIGURE 28. Morphology of *Moraea* species.—A. *M. algoensis*.—B. *M. tripetala*.—C. *M. debilis*.—D. *M. barnardii*.—E. *M. barkerae*.—F. *M. thomasiae*. (Flowers life size, stamens and style branches ca. × 2.)

almost free filaments that are barely united at the base, a feature otherwise found only in the related *M. barnardii*. The latter is distinguished by its white flower which lacks inner tepals entirely.

All forms of *M. tripetala* are slender and often have an unbranched stem; there is, however, considerable variation in flower size, form, and particularly in the structure of the inner tepals. The latter are most often short and spikelike but are occasionally trifid or may be entirely absent. The color and texture of the corm tunics is also notably variable. This character is evidently linked to the wide range of soils on which the species grows. Plants from sandy areas with adequate moisture tend to have small corms with dark tunics, while plants in drier sandy soils have larger corms with very coarse dark fibers. In general, plants on clay soils in dry areas have large corms with very pale tunics which have fine inner fibers but quite coarse outer layers. This rule does not hold in all cases as small dark corms may be encountered among plants on a clay substrate.

The species is common throughout the entire southwestern Cape from Nieuwoudtville in the north to Mossel Bay. It is particularly tolerant of arid conditions and extends further inland than most winter rainfall species of *Moraea*, to Calvinia, Sutherland and Prince Albert.

The following major forms can be distinguished:

a. A robust large-flowered form occurring on sandy soils in the Caledon and Cape Town districts.

b. A tall, branched, very pale blue form from the Clanwilliam, Calvinia and Van Rhynsdorp areas (*M. amabilis*).

c. Short, small, purple-flowered plants found on clay slopes in the Ceres district.

d. A very short form with purple flowers and a single, or often 2 very narrow leaves, from arid areas of the Little Karoo, Matjesfontein and Touws River districts.

e. Early flowering, quite large-flowered plants with a pubescent leaf, in the Cape Town–Malmesbury area (*Iris mutila*).

f. A very late flowering (November–January), small-flowered form from higher altitudes in the southwestern Cape, usually on sandy soils (*M. tripetala* var. *jacquinii*).

The morphological variability of *M. tripetala* is mirrored in a degree of karyotypic variation unusual in *Moraea*. Though all forms so far examined have a diploid number of $2n = 12$, variation in proportions of chromosome arms and in satellite location indicate considerable cytological differentiation of various races. When sufficient material has been studied it will hopefully become possible to correlate cytological and morphological variation to form a coherent picture of evolution in the species.

South Africa. cape: 31.18 (Van Rhynsdorp): Top of Giftberg Pass (DB), *Thompson 484* (STE). Bullshoek (DD), *Schlechter 8383* (K, MO, PRE, S).

31.19 (Calvinia): W of Nieuwoudtville (AC), *Lewis s.n.* (SAM-60842); *Marloth 7640* (PRE). Glenlyon, Nieuwoudtville, *Hardy 73* (PRE); *Goldblatt 3098* (MO). Lokenberg, *Acocks 18900* (K, PRE). 10 km SW of Calvinia (DA), *Acocks 19491* (M, PRE, S).

32.18 (Clanwilliam): Olifants River at Clanwilliam, (BB), *Penther 685* (K). Boskloof road, near Clanwilliam, *Goldblatt 2457* (K, MO, NBG, PRE, S). Piketberg Mt. (DC), *Stokoe s.n.* (SAM-55635); *Barker 7563* (NBG). Flats near Porterville (DD), *Loubser 937* (NBG).

32.20 (Sutherland): Koedoes Mts. (CD), *Goldblatt 547* (BOL). 70 km S of Sutherland (DC), *Goldblatt 3222* (MO).

33.18 (Cape Town): Ysterfontein (AC), *Lewis Grant 2580* (MO). Bokbaai (BB), *van der Merwe 1594* (PRE). Lions Head, Cape Peninsula (CD), *Prior s.n.* (K, PRE). Kenilworth, *H. Bolus 5692* (BOL, PRE). Table Mt., *Marloth 7280, 6051* (both PRE). Between the Salt

River and Kalabas Kraal (DA), *Hutchinson 161a* (K, PRE). Stellenbosch (DD), *Strey 559, 560* (PRE).

33.19 (Worcester): Lower slopes, Gydo Pass (AB), *Hafstrom & Acocks 323* (PRE). Gydo Pass, *Marloth 10602* (PRE); *Barker 6836* (NBG); Gouda (as Piketberg road) (AC), *Schlechter 4851* (B, GRA, K, PRE). Bainskloof (CA), *Lewis Grant 2235* (MO). Mts. S of Wemmershoek (CC), *Andreae 675* (PRE). Foot of French Hoek Pass, E side (CD), *Marsh 666* (PRE, STE). Lower slopes of Rabiesberg (DA), *Lewis s.n.* (BOL-21733, PRE); *van der Gaast s.n.* (NBG). Foot of Naudesberg, Koo (DB), *Lewis 6054* (NBG).

33.20 (Montagu): Tweedside (AB), *Barker 7466* (NBG). Klein Roggeveld (BA), *Marloth 9595, 9602* (both PRE). Wildehondekloof Pass (DC), *Goldblatt 2839* (MO, NBG, PRE, S).

33.21 (Ladismith): Garcias Pass (CC), *Galpin 4651* (K).

33.22 (Oudtshoorn): Near Cango Caves (AC), *Gillett 1695* (STE). Between Prince Albert and Klaarstroom (A) *Leipoldt s.n.* (PRE).

34.18 (Simonstown): Fish Hoek (AB), *Wedermann & Oberdieck 792* (PRE). Red Hill, Simonstown, *Taylor 5240* (PRE, STE). Sir Lowrys Pass (BB), *Schlechter 7222* (GRA); *Goldblatt 2506* (MO, NBG, S). Hottentots Holland kloof, *Ecklon & Zeyher s.n.* (S). S of Pringle Peak (BD), *Boucher 624* (PRE, STE). Palmiet River mouth, *Gillett 4250* (BR, MO).

34.19 (Caledon): Near Caledon (AB), *H. Bolus 9169, 7878* (both K, PRE). Zwartberg, Caledon, *Schlechter 5556* (BOL, BR, PRE); *Goldblatt 2509* (MO). Kleinrivier Mts., (AD), *Zeyher 1650* (GRA, K). Genadendal (BA) *Lindeberg s.n.* (S). Hills above Pearly Beach (DA), *Goldblatt 2607* (MO).

34.20 (Bredasdorp): Bontebok Park, Swellendam (AB), *Liebenberg 6544* (PRE). De Hoop (AD), *van der Merwe 1077* (PRE). 14 km E of Swellendam (BA), *Marsh 1004* (PRE, STE).

34.21 (Riversdale): Gouritz River bridge (BA), *Galpin 4647* (PRE).

34.22 (Mossel Bay): Goukamma Nature Reserve (BB), *Heineken 206* (PRE).

36. **Moraea debilis** Goldbl., Ann. Missouri Bot. Gard. 63: 21. 1976. TYPE: South Africa, Cape, clay slopes SW of Caledon, *Goldblatt 673* (BOL, holotype; K, MO, PRE, S, isotypes).—FIG. 28C.

Plants slender, 15–40 cm high, usually branched. *Corm* ca. 1 cm in diameter; tunics pale, finely fibrous. *Leaf* solitary, basal, linear, pubescent on the outer surface and/or ciliate on the margins, exceeding the inflorescence. *Stem* laxly branched, rarely simple, the bract leaves dry. *Spathes* herbaceous, or dry above, the apices attenuate or lacerated; inner spathe 4–5.5 cm long, the outer ca. half the inner. *Flowers* purple, fading to a pale mauve and becoming lightly speckled; outer tepals spreading, ca. 2 cm long with a slender bearded claw and a lanceolate limb ca. 1 cm long; inner tepals ca. 1 cm long, erect, filiform, usually tricuspidate with the central cusp much exceeding the laterals. *Filaments* ca. 4 mm long, joined for ca. half the length; *anthers* ca. 5 mm long. *Style branches* ca. 7 mm long, the crests lanceolate, to 3 mm long. *Capsule* narrowly ovoid-clavate; *seeds* angled. Chromosome number $2n = 12$.

Flowering time: September to October.

Distribution: Clay soils in the Caledon district, southwestern Cape.—FIG. 29.

This slender, dainty plant with its small mauve flowers and reduced inner tepals is clearly allied to the well-known and widespread *Moraea tripetala*. *Moraea debilis* grows in clay soils among low growing shrubs in the Caledon district and is typically late flowering. It is distinguished from the related *M. tripetala* and *M. barkerae* by its pubescent leaf and small flowers, which have thread-like, trifid-tricuspidate inner tepals, and by its filaments which are united for about half their length unlike those of its two close allies.

SOUTH AFRICA. CAPE: 34.19 (Caledon): SW of Caledon (AC), *Barnard s.n.* (BOL-30694); *Goldblatt 673* (BOL, K, MO, PRE, S). Between Bot River and Caledon, *Mauve 4893* (PRE). Ca. 12 km E of Caledon (BA), *Barker 10851* (NBG, S).

Without precise locality: Caledon district, *Pappe s.n.* (SAM-70709); *Leipoldt 3562* (BOL); *Schlechter 5527* (BOL, PRE).

37. **Moraea barnardii** L. Bol., J. Bot. 71: 22. 1933. TYPE: South Africa, Cape, top of Shaws Pass, *Barnard s.n.* (BOL-20067, holotype).—FIG. 28D.

Plants small, slender, rarely exceeding 30 cm in height. *Corm* ca. 1 cm in diameter; tunics light brown, coarsely fibrous. *Produced leaf* solitary, linear, canaliculate, usually exceeding the inflorescence, ca. 1.5 mm wide, glabrous. *Stem* terete, simple or 1-branched, bearing 2 bract leaves. *Spathes* dry, brown, acuminate; inner spathe ca. 4.5 cm long, the outer to 2.5 cm long. *Flower* white, marked with blue purple veins and nectar guide; outer tepals ca. 2 cm long, the limb to 1.3 mm long, the margins undulate; inner tepals absent. *Filaments* 8–9 mm long, united at the base for 2 mm; *anthers* oblong, 3–4 mm long, red. *Style branches* ca. 6 mm long, the crests 6–7 mm long, lanceolate. *Capsule* clavate, red flushed, ca. 1 cm long; *seeds* angled. Chromosome number $2n = 12$.

Flowering time: Mid September and early October.

Distribution: Local in the mountains of the Caledon district in sandy soil.—FIG. 29.

This diminutive species is extremely rare, being well known from one locality only, the top of Shaws Pass, between Caledon and Hermanus, where it blooms regularly at the end of September. One collection, however, from Gansbaai, well to the south, suggests that *M. barnardii* may not be as rare as the record indicates.

Moraea barnardii is allied to the widespread *M. tripetala* but differs in having a white flower, delicately veined in purple, undulate outer tepals, and it completely lacks inner tepals. *Moraea tripetala* in contrast is colored blue to purple, or rarely pink, the margins of the outer tepals are straight-edged and rarely are the inner tepals absent—more often they are reduced to short cusps.

SOUTH AFRICA. CAPE: 34.19 (Caledon): Top of Shaws Pass (AD), *Barker 18* (BOL, K); *Barnard s.n.* (BOL-20067, NBG-93752, SAM-69609); *Loubser 2153* (NBG); *Mauve & Barnard 4765* (PRE). Gansbaai (CB), *Gillett 4311* (BOL).

38. **Moraea incurva** Lewis, S. African Gard. 23: 167. 1933. TYPE: South Africa, Cape, between Wellington and Tulbagh, *Stanford s.n.* (BOL-20185, holotype).

Plants slender, 35–40 cm high, unbranched. *Corm* ca. 1.5 cm in diameter; tunics of dark brown fibers. *Leaf* solitary, basal, linear, 2–4 mm wide, exceeding the inflorescence. *Stem* simple, 3–4 internodes long. *Spathes* herbaceous, dry above, attenuate; inner spathe 4–5 cm long, the outer about 2.5 cm long. *Flower* violet blue, the nectar guide yellow; outer tepals ca. 2 cm long, lanceolate, the limb ca. 1.5 cm; inner tepals entire, erect, ca. 1.8 cm long, and to 6 mm wide, the limb curved inward. *Filaments* 1.1 mm long, free near the apex; *anthers* ca. 3 mm long. *Style branches* 4 mm long, the crests ca. 4 mm long. *Capsule* clavate, ca. 1.5 cm long; *seeds* angled. Chromosome number not known.

Flowering time: October.

Distribution: At the foot of the Elandskloof Mountains, probably in clay soil.—FIG. 29.

Moraea incurva is known only from the type specimens, collected somewhere north of Wellington at the foot of the Elandskloof Mountains. It may well be extinct since this area is now intensively farmed. The species appears most closely related to *M. tripetala* from which it differs by its large, entire inner tepals and united filaments. The obvious relationship to *M. tripetala*, and to a lesser extent to *M. unguiculata*, places *M. incurva* almost without doubt in section *Vieusseuxia*, even though it has entire inner tepals. Although unusual in the section, entire inner tepals also occur in *M. insolens*, *M. barkerae*, *M. thomasiae*, as well as in forms of *M. neopavonia* and *M. lurida*.

SOUTH AFRICA. CAPE: 33.19 (Worcester): Between Wellington and Tulbagh, *Stanford s.n.* (BOL-20185).

39. **Moraea barkerae** Goldbl., sp. nov. TYPE: South Africa, Cape, Cedarberg, 1,400 m, above Algeria on trail to Middelberg, *Goldblatt 3245* (MO, holotype; K, NBG, PRE, S, isotypes).—FIG. 28E.

Planta 30–50 cm alta, simplex vel pauciramosa. *Cormus* ca. 1.5 cm diameter. *Folium* solitarium, lineare, canaliculatum. *Spathae* herbaceae, apice sicco, attenuato. *Flos* pallidum salmoneum, pupureis notatis; tepala exteriora lanceolata, ca. 3 cm longa, limbis effusis; interiora erecta, limbis arcuatis, apicibus attenuatis, integribus vel tricuspidatis. *Filamenta* 1 cm longa, connata in parte dimidia.

Plants 15–40 cm high, occasionally branched. *Corm* to 1.5 cm in diameter; tunics of coarse light brown fibers. *Leaf* solitary, basal, linear, glabrous, much exceeding the inflorescence. *Stem* glabrous, usually simple or bearing 1 branch. *Spathes* herbaceous with dry, dark brown, attenuate apices; inner spathe 5.5–7 cm long, the outer 3–4.5 cm long. *Flowers* white to salmon, with purple markings; outer tepals ca. 3 cm long, lanceolate, the claw to 1 cm, lightly bearded, the limb spreading, ca. 1 cm wide; inner tepals ca. 2.5 cm long, erect, to 6 mm at the widest point, the apex produced as a long slender cusp, usually entire, occasionally trilobed. *Filaments* to 1.5 cm long, united for ca. ⅔ of their length; *anthers* 5 mm long, apiculate. *Style branches* ca. 1 cm long, the crests ensiform, to 1 cm long. *Capsule* and *seeds* not known. Chromosome number $2n = 12$ (*Goldblatt 3245*, type collection).

Flowering time: Late September to November.

Distribution: Mid and upper altitudes in the Cedarberg and Cold Bokkeveld Mountains.—FIG. 29.

Although *Moraea barkerae* has been known for some time, first having been collected by M. A. Pocock in the 1930s, it has remained until now undescribed. It is certainly one of the most beautiful of all moraeas with slender stems bearing delicate salmon to shell pink flowers marked with purple nectar guides. The species is not common, though has been recorded from several different places in the Cedarberg and Cold Bokkeveld Mountains. It occurs from fairly low altitudes such as Elands Kloof, where it flowers in late September, to the high Cedarberg, where flowering is delayed until December.

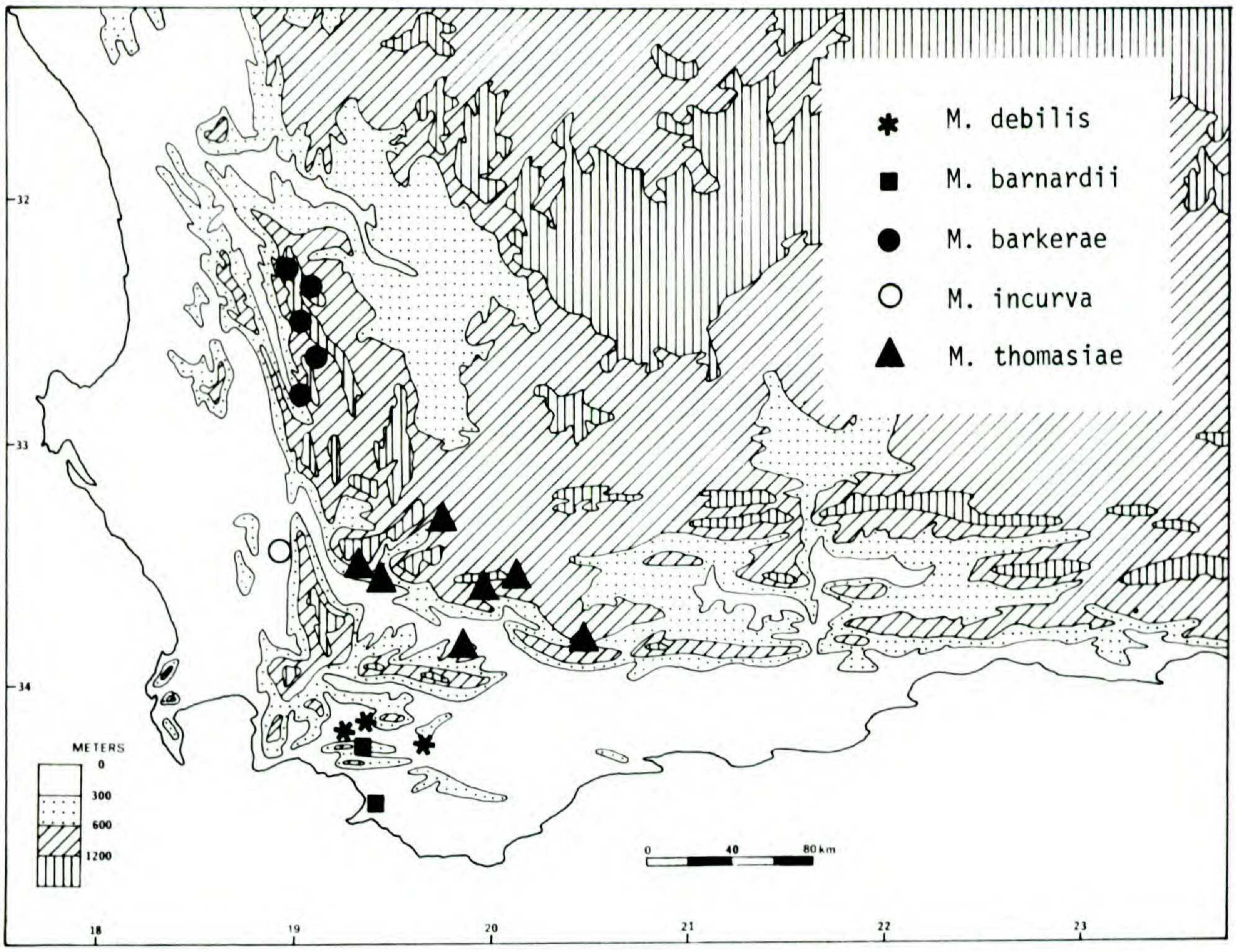

FIGURE 29. Distribution of *Moraea debilis*, *M. barnardii*, *M. barkerae*, *M. incurva*, and *M. thomasiae*.

The inner tepals are usually entire with an erect attenuate incurved limb like that found in *Moraea incurva.* Occasionally, however, the inner tepal is clearly 3-lobed with two small obtuse lateral projections formed at the base of the central attenuate cusp. The slender form and lack of branching suggest affinities with *M. tripetala* and *M. unguiculata* as well as to *M. incurva*, but the relationship is probably not close; *M. barkerae* thus appears rather isolated in section *Vieusseuxia.*

The species is named in honor of Miss F. W. Barker, the well-known South African botanist and retired Curator of the Compton Herbarium, Kirstenbosch. She has long been interested in the bulbous flora of the southwestern Cape, and made one of the first collections of the species now named after her.

SOUTH AFRICA. CAPE: 32.19 (Wuppertal): Near Middelberg, 1400 m, Cedarberg (AC). *Jackson s.n.* (NBG, SAM-68452); *Goldblatt 3245* (MO, NBG, PRE, S), *3260* (MO). Elands Kloof, 1400 m, (CA), *Barker 3103* (NBG, PRE, S). Hoog Verloren, Sneeuberg, Cedarberg, *Pocock 403* (STE). Grootfontein farm, Olifants R. valley, ridge E of farm (CC) *Oliver 3980* (STE).

40. **Moraea thomasiae** Goldbl., Ann. Missouri Bot. Gard. 63: 20. 1976. TYPE: South Africa, Cape, Karoo Garden, Worcester, *Goldblatt 2422* (NBG, holotype; BOL, K, MO, PRE, S, isotypes).—FIG. 28F.

Plants small, slender, 15–30 cm high. *Corm* ca. 1 cm in diameter; tunics dark brown to black. *Leaf* solitary, ± basal, linear, ca. 3 mm wide, glabrous, exceeding the inflorescence. *Stem* simple. *Spathes* herbaceous with brown attenuate apices; inner spathe up to 6 cm long, the outer ca. half the length of the inner. *Flowers* yellow; outer tepals with a narrow, long, erect claw, 1.5 cm long, the limb reflexed, ca. 2 cm long; inner tepals erect, narrowly lanceolate, up to 2 cm long. *Filaments* to 5 mm long, free almost to the base; *anthers* ca. 6 mm long. *Style branches* ca. 1.5 cm long, bearing linear crests ca. 1 cm long. *Capsules* and *seeds* not known. Chromosome number $2n = 12$.

Flowering time: August to mid September.

Distribution: Clay and shale slopes, usually on a south aspect, in the Montagu and Worcester districts.—FIG. 29.

Moraea thomasiae, only recently described, indicates that the southwestern Cape is not as well known botanically as might be expected for an area studied since the 1770s. No specimen is known to have been collected prior to 1945, and yet recently several people have independently found this species in widely separate areas. It is now clear that *M. thomasiae* is common in the Worcester–Montagu area, occurring in semikaroid vegetation where it favors the moister, south-facing slopes of shale hills and banks.

Though very like *M. angusta* in general appearance, *M. thomasiae* is unrelated, and the two belong to different subgenera. *Moraea thomasiae* stands in a rather isolated position in subgenus *Vieusseuxia*; its slender habit, unbranched stem, and solitary leaf suggest no close allies. It can always be distinguished from the similar but unrelated *M. angusta* by its canaliculate leaf, terete ovary, and acuminate spathes, while its yellow flower and long, narrow inner tepal set it apart from certain forms of *M. tripetala* which have similar, almost free filaments.

SOUTH AFRICA. CAPE: 33.19 (Worcester): Hex Pass, near summit (BD), *Mauve & Oliver 192* (STE). Karoo Garden, Worcester (CD), *Bayer 7* (NBG); *Goldblatt 2422* (K, MO, NBG, PRE, S). Onse Rug Farm, Worcester district, *Barker 9446* (NBG).

33.20 (Montagu): Oudeberg, Montagu district (CA), *Acocks 20539* (NBG, PRE). Burgers Pass, Koo district (BD), *Thomas s.n.* (BOL); *Mauve & Oliver 197* (STE). Vrolikheid, McGregor district (DD), *Jooste 154, 181* (both STE).

41. **Moraea unguiculata** Ker,[7] Bot. Mag. *tab.* 593. 1802. TYPE: Illustration in Bot. Mag. *tab.* 593.—FIG. 30.

Iris tricuspis Thunb. var. *minor* Jacq., Ic. Pl. Rar. 2, *tab.* 222. 1792. TYPE: Illustration in Jacq., Ic. Rar. *tab.* 222. 1792.
Moraea tenuis Ker, Bot. Mag. *tab.* *1047*. 1807. TYPE: Illustration in Bot. Mag. *tab.* *1047*.
Vieusseuxia tenuis (Ker) R. & S., Syst. Veg. 1: 491. 1817.
Moraea violacea L. Bol., S. African Gard. 28: 116. 1928, nom. illeg., non *M. violacea* Baker. TYPE: South Africa, Cape, Ceres, *Cook s.n.* (BOL-17020).
M. ceresiana Lewis, J. S. African Bot. 7: 57. 1941, nom. nov. pro *M. violacea* L. Bol.

Plants 15–60 cm high, simple, or few branched. *Corm* 1–2 cm in diameter; tunics pale to dark grey, fine to coarsely fibrous. *Leaf* solitary, basal, linear,

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[7] Not to be confused with *Moraea unguicularis* Lam. = *Tritoniopsis unguicularis* (Lam.) Lewis.

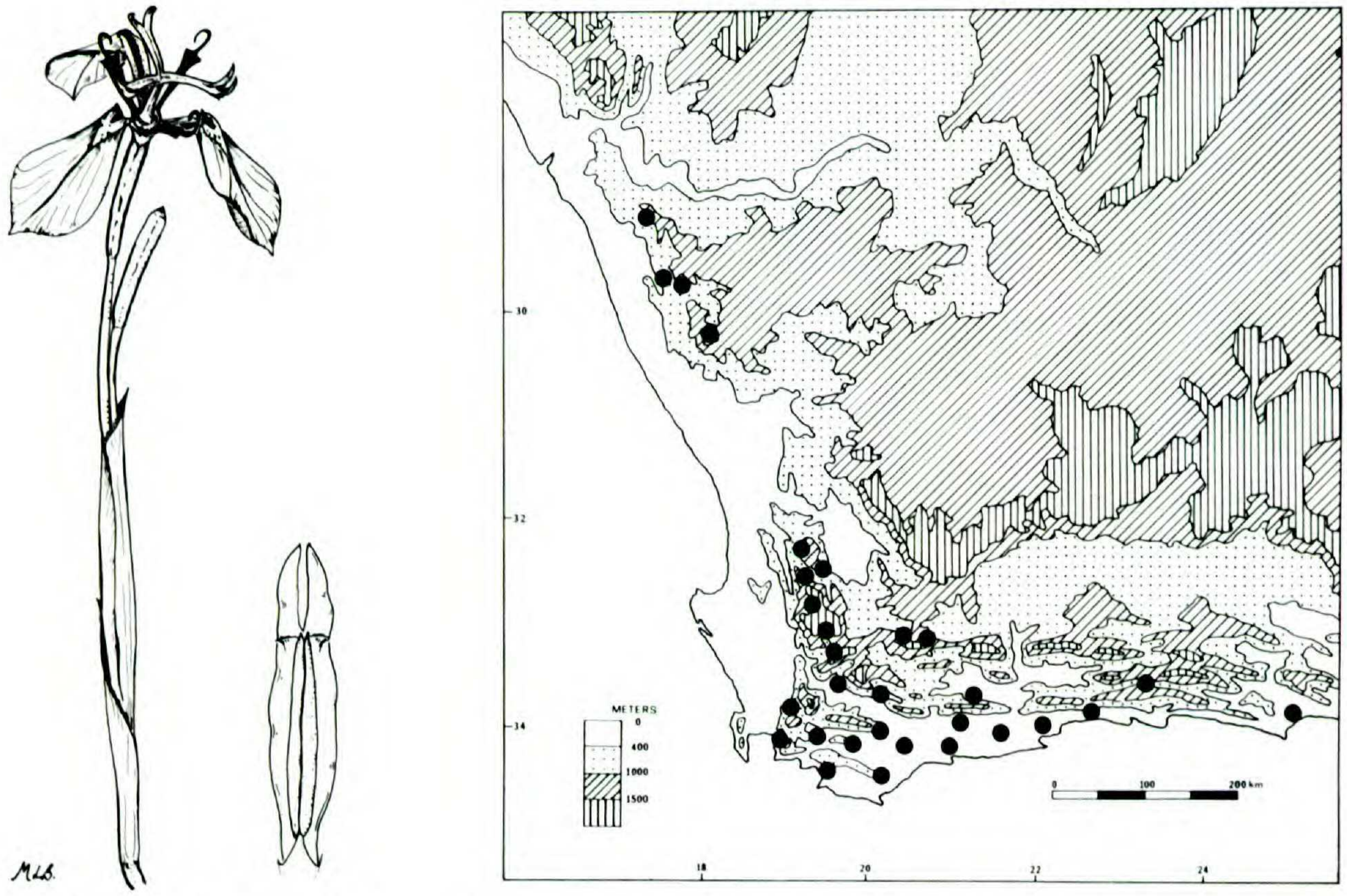

Figure 30. Morphology and distribution of *Moraea unguiculata* (life size) with stamen and style branch enlarged.

canaliculate, glabrous. *Stem* simple or more often branched. *Spathes* herbaceous, becoming dry above, the apices attenuate, dark brown; inner spathes 3–5 cm long, the outer ca. half the length of the inner. *Flower* white, cream, yellow, brown or deep blue, the nectar guide yellow; outer tepals lanceolate, 1.2–2.2 cm long, the claw ca. half the length of the limb, bearded, the limb reflexed from 45° to 90°; inner tepals erect, 7–12 mm long, tricuspidate with a long, central, incurved cusp and 2 short obtuse lateral lobes. *Filaments* 4–6 mm long, joined almost to the apex; *anthers* 3–4 mm long, apiculate. *Style branches* ca. 5 mm long, the crests 2.5–4 mm long. *Capsule* clavate, 1.3–1.5 cm long; *seeds* small, angular. Chromosome number $2n = 12$.

Flowering time: October to early December.

Distribution: Widespread throughout the winter rainfall region from Namaqualand in the north to the Humansdorp district in the east and local in the Karoo. —Fig. 30.

Moraea unguiculata has for some time been known by its later synonym, *M. tenuis.* Both species were described by Ker and are typified by plates in Curtis's *Botanical Magazine. Moraea tenuis*, described in 1807, is readily identified with the brown-flowered form of *M. unguiculata.* The typical form, dating from 1802, is more difficult to identify as it cannot be matched exactly with any known form of the species. The illustration depicts a white flower, speckled with blue, but while the coloring is unusual, the entirely united filaments and characteristic trifid inner tepals with long and coiled central cusps are distinctive enough to make it almost certain that the type illustration represents a plant conspecific with Ker's later species, *M. tenuis.*

The species is very widely distributed over almost the entire winter rainfall area. It occurs locally on clay soils near Steinkopf and Spektakelberg in Namaqualand, and almost continuously from the Cedarberg, well to the south to the Humansdorp district, though absent from the Cape Peninsula. The small flowers vary in color from white or deep blue to shades of brown, and the latter forms are very inconspicuous. Like *M. tripetala*, the corm tunics appear to vary depending on the soil type; dark, coarse tunics are encountered on sandy soils, while plants on clay have pale tunics with rather finer fibers.

Moraea unguiculata may sometimes be confused with the small forms of *M. tripetala*, especially those with trifid inner tepals, but the united filaments of *M. unguiculata* contrast strongly with the almost free filaments of *M. tripetala*. The two closely related species, *M. bellendenii* and *M. tricuspidata* can be distinguished from *M. unguiculata* by size alone, and also by the inner tepals which in these two species have a short obliquely twisted central cusp, while *M. unguiculata* has a very long, slender and coiled cusp.

SOUTH AFRICA. CAPE: 29.17 (Springbok): 4.8 km W of Steinkopf (BA), *Goldblatt 2777* (MO); *Acocks 19537* (K, PRE). Modderfontein (BC), *H. Bolus s.n.* (BOL-6618, K). 22 km W of Springbok, foot of Spektakelberg (DA), *Goldblatt 2791* (MO); *Acocks 19574* (K, M, PRE).

30.18 (Kamiesberg): Between Pedroskloof and Leliefontein (D), *Drège 2607, 2609* (both S).

31.24 (Hanover): Leopards Vlei, Richmond district (B), *H. Bolus 14001* (BOL).

32.19 (Wuppertal): Tafelberg, Cedarberg (AC), *Van Niekerk 18169* (BOL). Hoog Verloren, Sneeuberg, *Pocock 385* (STE). Middelberg plateau, *Compton 12701* (NBG). Krom River Kloof (CA), *Esterhuysen 17975* (BOL, PRE). Gideonskop (CB), *Stokoe s.n.* (SAM-54515). De Keur (CD), *Compton 18793* (NBG).

33.18 (Cape Town): Stellenbosch (DD), *Duthie 285* (BOL). Bankhoek, *Bond 828* (NBG).

33.19 (Worcester): Gydo Pass (AB), *Bond 715* (NBG). Ceres (AC), *Cook s.n.* (BOL-17020). Prince Alfreds Hamlet, *Oliver 5065* (MO, STE). Schurfdeberg (AD), *Zeyher 4084* (SAM). Lakenvlei, *Olivier s.n.* (NBG-58981). Baviaansberg, NW of Ceres (BA), *Compton 12869* (NBG). San Sebastians Kloof (CA), *Lewis 1614* (SAM). Bains Kloof, *Barker 4646* (NBG). Karoo Garden, Worcester (CB), *Olivier 163* (PRE, STE). Robertson karoo (DD), *Compton 5678* (NBG).

33.20 (Montagu): Whitehill Ridge, S slopes (BA), *Compton 3612* (BOL, NBG), *15174* (NBG). Witteberg, above Elandsfontein, *Nordenstam 3254* (S). Pasture below 10 O'Clock Peak (CD), *Wurts 364* (NBG).

33.21 (Ladismith): Muiskraal (CC), *Galpin 4648* (PRE). Garcias Pass, *H. Bolus s.n.* (BOL).

33.23 (Uniondale): 8 km W of Avontuur (CA), *Gillett 1605* (BOL).

34.18 (Simonstown): S slopes Helderberg (BB), *Galpin 12312* (PRE). Sir Lowrys Pass, *Leighton 823* (BOL, PRE); *Lewis 973* (GRA, SAM); *Barker 3373* (NBG).

34.19 (Caledon): Botrivier (AA), *Zeyher 4085* (SAM). Caledon (AB), *Guthrie s.n.* (BOL-17857). Hermanus (AC), *H. Bolus 9830* (BOL); *Goldblatt 3010.* Riviersonderend (BB), *Zeyher 4083* (SAM).

34.20 (Bredasdorp): Storms Vlei (AA), *Galpin 4652* (GRA, PRE); *Leipoldt 3568* (BOL); *Dymond s.n.* (BOL-21240). Bontebok Park, Swellendam (AB), *Grobler 465* (PRE). Oysterbeds Hotel (BD), *Marsh 809* (PRE). Mountain above Bredasdorp (CA), *Barker 10852* (NBG). Bredasdorp, *Loubser 392* (BOL).

34.21 (Riversdale): 8 km S of Riversdale (AA), *Lewis 5634* (NBG). Near Riversdale, *Muir 1224, 2677* (both BOL).

34.22 (Mossel Bay) Great Brak River (AA), *Burchell 6150, 6202* (both K); *Lewis 5602* (NBG, PRE). Above Victoria Bay (BA), *Lewis 3576* (SAM); *Barker 8179* (NBG).

34.24 (Humansdorp): Oudebosch flats (AA), *Fourcade 3361* (BOL), *961* (BOL, GRA).

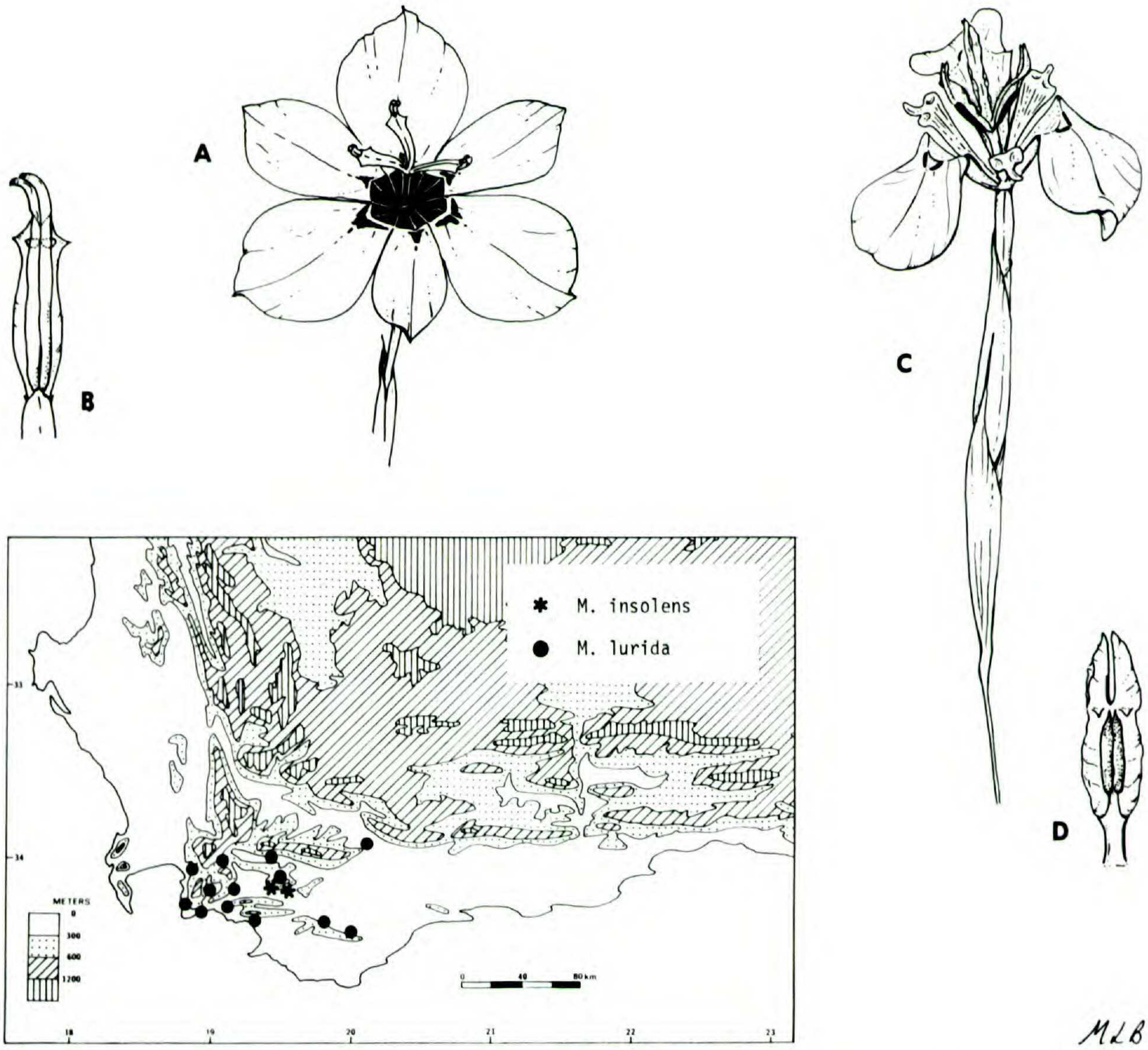

FIGURE 31. Morphology and distribution of *Moraea insolens* and *M. lurida*.—A–B. *M. insolens*.—A. Flower (life size).—B. Style branch and anther enlarged.—C–D. *M. lurida*.—C. Flower (life size).—D. Style branch and stamen enlarged.

42. **Moraea lurida** Ker, Bot. Reg. *tab. 312.* 1818. TYPE: Illustration in Bot. Reg. *tab. 312.*—FIG. 31C–D.

Vieusseuxia lurida (Ker) Sweet. Hort. Brit., ed. 1. 395. 1825.
Phaianthes lurida (Ker) Raf., Fl. Tell. 4: 30. 1838.
Moraea montana Schlecht., Bot. Jahrb. Syst. 27: 92. 1900. TYPE: South Africa, Cape, Onrus R. mouth, *Schlechter 9494* (B, lectotype; BOL, GRA, K, PRE, isolectotypes).
M. fusca Baker, Bull. Misc. Inform. 1906: 42. 1906. TYPE: South Africa, Cape, Caledon, *Penther 762* (K, holotype; BOL, isotype).

Plants 20–30 cm high, often branched. *Corm* 1–1.5 cm in diameter with tunics of coarse, often woody fibers. *Leaf* solitary, basal, linear, glabrous, exceeding the inflorescence. *Stem* glabrous, the branches held away from the axis. *Spathes* herbaceous with dry attenuate apices; inner spathe (3.5–)4–5.5(–7.0) cm long, the outer ca. half the inner. *Flowers* often a livery maroon color, or partly to entirely yellow to cream, usually bad smelling; outer tepals 2.2–3.0 cm long with a broad claw 1.3–1.7 cm long, the claw broadest below the knee and narrowed at the apex, lightly papillate, the limb ca. 1 cm wide, spreading to reflexed; inner tepals either entire, becoming apiculate, or ± 3-lobed at the apex, 1.2–1.5 cm long, with a distinct broad claw and spreading limb. *Filaments* ca.

6 mm long, joined almost to the apex; *anthers* 4–6(–8) mm long, apiculate. *Style branches* to 6 mm long, ca. 2 mm wide, the crests 2–3 mm long, triangular. *Capsule* clavate, to 1.5 cm long; *seeds* many, angular. Chromosome number $2n = 12$.

Flowering time: October to November.

Distribution: Sandy flats and lower mountain slopes, from Sir Lowrys Pass to Bredasdorp.—FIG. 31.

Moraea lurida is very common on sandy mountain soils throughout the Caledon district. It is, however, rarely seen except a year or two after a veld fire when it appears in large numbers on recently burnt slopes. The species is extremely variable in flower color and to some extent in form. Typically the flower is a dark liverish red, and smells faintly of bad meat; other colors range from red marked with yellow, through orange, violet, brown to cream and white. The lighter colored forms do not seem to smell, yet are equally attractive to flies which visit *M. lurida* in large numbers and are probably the principal pollinators. Individual populations are usually relatively uniform in color, but the whole range of known colors has been observed in some places. The shape of the inner tepals varies from fairly broad and entire to truly tricuspidate with a fairly long coiled central cusp.

Moraea lurida is allied to *M. insolens*, a very local species with extremely large anthers, occurring near Caledon and to the widespread, white-flowered *M. tricuspidata*. Confusion is possible between the light colored forms of *M. lurida* and *M. tricuspidata*. While it is sometimes difficult to tell the two apart, *M. lurida* is distinguished by its preference for sandy habitats, grey to black corm tunics, beardless, but minutely papillate tepals, and red orange pollen.

SOUTH AFRICA. CAPE: 34.18 (Simonstown): Foot of Sir Lowrys Pass (BB), *Lewis 3575* (SAM). Near Prinkle Bay (BD), *Compton 20072* (NBG). Bettys Bay, *Ebersohn s.n.* (NBG-92594). Arieskraal, *Barker 3363* (NBG). Eksteens Kloof, Kogelberg Reserve, *Boucher 925* (PRE, STE).

34.19 (Caledon): Houwhoek Pass (AA), *Barnard s.n.* (BOL-20851, K, PRE, SAM); *Werdermann & Oberdieck 157* (PRE). Foot of Viljoens Pass, *Goldblatt 2491* (MO, PRE). Caledon (AB), *Penther 762* (BOL, K). Zwartberg, *H. Bolus 8489* (BOL, K); *Bodkin s.n.* (BOL); *Schlechter 5530* (BOL, BR); *Galpin 4644* (GRA, K, PRE). Slopes near Hermanus (AC), *H. Bolus 9332* (BOL, GRA); *Goldblatt 674* (BOL). Onrus R. mouth, *Schlechter 9494* (B, BOL, GRA, PRE). Genadendal (BA), *Pappe s.n.* (SAM-70704); *Marloth 7102* (PRE). Dasberg near Storms Vlei (BB), *Stokoe s.n.* (SAM-59818).

34.20 (Bredasdorp): Bredasdorp (CA), *Breach s.n.* (BOL); *Frowein s.n.* (PRE); Springfield Estates, *Stokoe s.n.* (SAM-60095).

43. **Moraea insolens** Goldbl., Fl. Pl. Africa. *tab. 1639.* 1971. TYPE: South Africa, Cape, Caledon district, Drayton siding, *Goldblatt 570* (BOL, holotype; K, PRE, isotypes).—FIG. 31A–B.

Homeria maculata Klatt, Linnaea 34: 628. 1863, pro parte. TYPE: South Africa, Cape, Caledon district, "Boontjeskraal" near Zwartberg, *Ecklon & Zeyher* 259 (B, lectotype; S, isolectotype); excl. paratype *Ecklon & Zeyher Irid.* 38 (B) coll. "Langehoogde," Caledon district = *Homeria.*

Plants medium tall, to 35 cm high, growing in small clumps. *Corm* ca. 1 cm in diameter; tunics brown, of coarse fibrous layers, extending upwards in a neck. *Leaf* solitary, linear, canaliculate, usually exceeding the inflorescence. *Stem* usually branched. *Spathes* herbaceous with dry scarious apices; inner spathe 5–6 cm long, the outer 3–4 cm. *Flowers* up to 5 cm in diameter, either bright orange or creamy yellow, marked in the center with brown; outer tepals ca. 3 cm long, and to 2 cm wide, poorly differentiated into limb and claw; inner tepals similar to the outer but smaller, to 2.5 cm long, 1.5 cm wide. *Filaments* ca. 4 mm long, free towards the apex; *anthers* ca. 8 mm long, exceeding the style crests, the pollen orange. *Style branches* 4 mm long, narrow, the crests short, triangular. *Capsule* clavate, *seeds* angled, small. Chromosome number $2n = 12$.

Flowering time: Late September and October.

Distribution: Clay and gravel soil on the southern slopes of the Caledon Zwartberg.—FIG. 31.

This unusual and extremely attractive species grows in clay and gravelly soil and is known only from the southern slopes of the Zwartberg at Caledon. Although very conspicuous when in flower, it has been recorded only rarely; the reason is evidently that, like its close ally *Moraea lurida*, it flowers well only after a fire. The robust many-branched plants produced in the first season after a fire give way subsequently to smaller, fewer-branched plants in the following years, and by the fourth season few if any plants come into bloom.

Apart from specimens obtained at the Caledon Wild Flower Show, there are few collections of *M. insolens*, and these are from only three localities, all near Caledon. Plants collected by Guthrie (BOL-17858) have cream flowers which are marked much as the typical orange form. *Moraea insolens* is believed to be closely related to *M. lurida*, a common species in the Caledon area, which is found only on sandy soils. *Moraea insolens* is, however, quite distinct, having a larger flower, rather differently proportioned tepals with shorter claws, and very distinctive long anthers, much exceeding the stigma lobes, a feature known in several other species, notably *M. gigandra*. This character has clearly arisen independently in the genus, as species with this feature are not closely related.

At the present time only one population is known, from the type area. At this site, only about one acre in extent, most plants were destroyed when a tiny plot was ploughed up and planted to wheat. Adjacent to the wheat field, several plants were discovered, and these, at present under no protection, could well be exterminated at any moment.

Only after *M. insolens* had been described did it become evident that *Homeria maculata* might be a synonym. The name *H. maculata* has long been applied to a form of *H. elegans* (Jacq.) Sweet with orange outer tepals but is actually based on two elements. The description applies to an orange-flowered plant with ovate-rotund outer tepals, marked green at the base; though known forms of *M. insolens* have brown markings, this color comment cannot be taken at face value since Klatt was describing dry plants collected forty years before. Specimens matching Klatt's description, and bearing Ecklon and Zeyher's manuscript name, *Vieusseuxia aurantiaca* at the Riksmuseum in Stockholm and at the Berlin-Dahlem Herbarium are undoubtedly *M. insolens*; the Berlin collection is selected as the lectotype. As *M. maculata* Sessé and Mociño (= *Tigridia*) blocks the transfer of Klatt's species to *Moraea*, no change in the nomenclature is necessary.

SOUTH AFRICA. CAPE: 34.19 (Caledon): "Boontjeskraal near Zwartberg" (AB), *Ecklon & Zeyher* 239 (B, S). 1 km W of Caledon, *Guthrie s.n.* (BOL-17858, K). Between Caledon

Baths and "Bredekamps Platz" at Steenboksrivier, *Ludwig & Beil sub Ecklon* (S). Drayton siding, E of Caledon (BA), *Barnard s.n.* (NBG-87509); *Barnard & Mauve 4703* (PRE); *Goldblatt 570* (BOL, K, PRE).

Without locality: Caledon Wild Flower Show 1912, Anon (BOL); 1931, comm. *Pillans s.n.* (BOL-30677).

44. **Moraea tricuspidata** (L.f.) Lewis, J. S. African Bot. 14: 89. 1948, name misapplied to *M. aristata* (as *M. glaucopis*).—FIG. 32A–B.

Iris tricuspidata L.f., Suppl. Pl. 98. 1781. TYPE: Several specimens belong to different species cited; origin of the lectotype probably foothills of Devils Peak, Cape Peninsula, *Thunberg s.n.* (Herb. Thunberg 1183, UPS, lectotype).

Iris tricuspis Thunb., Diss. Irid. no. 15. 1782. TYPE: As for *Iris tricuspidata.*

Vieusseuxia tricuspis (Thunb.) Spreng., Syst. Veg. 1: 165. 1825.

Moraea tricuspis (Thunb.) Ker, Bot. Mag. *tab. 696.* 1803; Baker, Fl. Cap. 6: 25. 1896, pro parte.

M. confusa Lewis, J. S. African Bot. 14: 89. 1948. TYPE: Illustration in Bot. Mag. *tab. 696.* 1803.

M. bellendenii subsp. *cormifera* Goldbl., Ann. Missouri Bot. Gard. 61: 236. 1973. TYPE: South Africa, Cape, Atherstone area, Albany distr., *Jacot-Guillarmod 6706* (GRA, holotype; RUH, isotype).

Plants 25–60 cm high, usually several branched. *Corms* 1–2 cm in diameter; tunics pale to dark brown, the fibers medium to coarse. *Leaf* solitary, basal, glabrous, 4–7 mm wide, exceeding the inflorescence and often trailing. *Stem* simple or more often branching from the upper nodes, the branches slender and held away from the axis. *Spathes* herbaceous, occasionally brown above with attenuate apices; inner spathe 4–7 mm long, the outer ca. half the inner. *Flowers* white, speckled at the center, the nectar guide usually brown to yellow, speckled; outer tepals 2.6–3.0 cm long, the claw slightly more than half the total length, 3–5 mm wide at the midpoint, pubescent, the limb ca. 1.5 cm wide, spreading; inner tepals trifid, to 1.2 cm long, excluding the central cusp, ca. 4 mm wide below the point of forking, the lateral lobes obtuse, the inner slender and coiled spirally inwards, 3–5 mm long. *Filaments* 6–7 mm long, free in the upper half; *anthers* ca. 5 mm long. *Style branches* 6–7 mm long, the crests usually 5–7 mm long. *Capsule* clavate, 1.5–2.2 cm long; *seeds* angled. Chromosome number $2n = 12, 24$.

Flowering time: (September) October to mid November.

Distribution: Lower mountain slopes, usually on heavy clay soils, extending from the Cape Peninsula as far east as Grahamstown; most common after fires. —FIG. 32.

This comparatively widespread species is common on the Cape Peninsula and it was here that Thunberg first collected it in the 1770s. Typification of *Moraea tricuspidata* has presented several problems, for Thunberg, in addition to a detailed description, cites several varieties and three localities. There are also several specimens annotated "tricuspis" in the Thunberg collection at Uppsala and these comprise four different species, *M. tricuspidata* = 1183, *M. villosa* = 1184, *M. glaucopis* = 1181 and 1182, and probably *M. bellendenii* = 1185A.

The detailed description given by Thunberg of *Iris tricuspis* upon which the younger Linnaeus based his *I. tricuspidata,* clearly refers to a white-flowered species with tricuspidate inner tepals. The outer tepals are described as having a yellow, black-spotted claw and suborbicular, white limb, while the inner tepals are brown spotted, with a trilobed limb, the inner lobe of which is a little longer than the outer ones. This description can only match the specimen numbered 1183 in the Thunberg collection, i.e., the common Cape Peninsula to Grahamstown species named by Lewis, *M. confusa.* Lewis associated the Thunberg species with *M. aristata* (= *M. glaucopis*), the rare white-flowered species with a conspicuous blue and yellow mark on its outer tepals and quite different inner tepals which though tricuspidate, have a long central cusp. With the revised interpretation of *M. tricuspidata*, *M. confusa* falls into synonymy.

The identity of Thunberg's "varieties" is not readily resolved, owing mainly to the peculiar way in which he lists them, so that it is not even clear how many he wished to recognize. Certainly, however, *M. bellendenii* "var. *flava*" and *M. villosa* "var. *purpurea*" are included, both being represented in his herbarium (numbers 1185A and 1184). Probably *M. aristata* is the "var. *alba*," numbers 1181 and 1182 in the collection. The remaining specimen, 1183, is *M. tricuspidata* and is chosen as lectotype. Brown's (1928) statement that the type is in the Smith Collection, sent there by Thunberg in 1791, does not seem likely for there is no reason to suppose this a type, above those still at Uppsala, especially as Brown says it has conspicuous blue markings on the petals and therefore does not conform to the description.

Moraea tricuspidata is closely allied to *M. bellendenii* and is barely distinguishable from it without knowledge of flower color, the flowers of *M. tricuspidata* being white and those of *M. bellendenii* yellow. However, slight but apparently consistent differences in size of floral parts can usually be relied upon to give a correct determination. The two species are undoubtedly distinct for they have different habitat preferences. *Moraea tricuspidata* always blooms slightly earlier and typically grows on clay slopes, while *M. bellendenii*, often taller and more branched, prefers sandy situations. Occasionally the two species do grow near one another as at Kloof Nek, Cape Town, and hybrids have been reported. These are said to be intermediate in height and pale yellow in color. It is also occasionally difficult to distinguish *M. tricuspidata* from the white forms of *M. lurida* such as are found on Houw Hoek Pass, but these are usually shorter, have dark corm tunics and invariably occur in sandy mountain soils.

A smaller form of *M. tricuspidata* with brown markings occurs in the extreme east of its range in the Grahamstown area. This was recognized as a distinct subspecies (Goldblatt, 1973) and was mistakenly assigned to *M. bellendenii* as subsp. *cormifera.* Though somewhat different from forms occurring further west, it is not given taxonomic recognition here and thus is reduced to synonymy.

Moraea tricuspidata is unusual in being heteroploid. Two populations from the eastern part of its range are tetraploid, including the distinct Grahamstown variant, while plants from a population on the Cape Peninsula are diploid, $2n = 12$. Further counts are necessary from populations over the entire range of the species before the significance of this can be assessed.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Signal Hill, Cape Peninsula (CD), *Goldblatt 237* (BOL). Camps Bay, *Zeyher s.n.* (SAM-20603). Slopes of Devils Peak Cape Peninsula, *H. Bolus 4004* (BOL); *Wolley Dod 1742* (BOL, K). Kirstenbosch, Herbarium hill, *Barker s.n.* (BOL); *Mauve s.n.* (PRE). Table Mountain, *Ecklon 821* (PRE). Swartboskloof, Jonkershoek (DD), *Lewis 1653* (BOL, SAM-58945). Foot of Victoria Peak, Jonkershoek, *Garside 1710* (K). Heldberberg, Stellenbosch, *Gillett 1798* (STE).

33.19 (Worcester): Laken Vlei (BC), *Olivier s.n.* (BOL, NBG-58896). French Hoek Pass (CC), *Barker 4150.*

33.23 (Willowmore): Lauterwater, Long Kloof (DC), *Fourcade 5022* (K).

33.24 (Steytlerville): Near Kareedouw (CD), *Goldblatt 2861* (MO, NBG). Twee Rivieren, Long Kloof (DC), *Fourcade 1722* (BOL, GRA).

33.25 (Port Elizabeth): Bakens River valley (DC), *Cruden 399* (GRA).

33.26 (Grahamstown): Atherstone area (BC), *Jacot-Guillarmod 6706* (GRA, RUH); *Goldblatt 2865* (K, MO, PRE, NBG). Grahamstown brickfields, *Daly & Cherry 41* (GRA); *Dyer 1661* (GRA, K).

34.18 (Simonstown): Hout Bay (AB), *Bond 1225* (NBG); *Lewis 52* (SAM).

34.24 (Humansdorp): Jeffrey's Bay (BB), *Goldblatt 2893* (MO).

Without precise locality: *Sparrman 3133* (S).

45. **Moraea bellendenii** (Sweet) N. E. Brown, Bull. Misc. Inform. 1929: 139. 1929.—Fig. 32C.

Vieusseuxia bellendenii Sweet, Hort. Brit., ed. 1. 395. 1827. TYPE: Illustration in Bot. Mag. *tab.* 772. 1803.

Moraea tricuspis (Thunb.) Ker var. *lutea* Ker, Bot. Mag. *tab.* 772. 1803. TYPE: Illustration in Bot. Mag. *tab.* 772. 1803.

M. pavonia (L.f.) Ker var. *lutea* (Ker) Baker, Fl. Cap. 6: 24. 1896.

Vieusseuxia spiralis de la Roche, Diss. 31. 1766. TYPE: Illustration in de la Roche, Diss. *tab.* 5. 1766.

Plants slender, 50–100 cm high, usually several branched. *Corms* 1.5–2 cm in diameter; tunics pale brown, of medium to coarse fibers. *Leaf* solitary, basal, linear, glabrous, to 1 cm wide, exceeding the inflorescence but trailing. *Stem* ± erect, branching at the nodes, the branches slender, ± upright. *Spathes* herbaceous, brown above, the apices attenuate; inner spathe 5–7 cm long, the outer ca. half this length. *Flowers* yellow, speckled in the center; outer tepals 2.2–3.3 cm long and up to 3 cm wide, the claw 0.9–1.3 cm long, very broad, veined and speckled, the limb 1.4–1.8 cm wide, ca. as long as wide, outspread to ascending; inner tepals trifid, 0.8–1.0 cm long excluding the inner cusp, usually ca. 4 mm wide at the point of forking, the lateral lobes short and obtuse, the inner slender, 2–4 mm long and coiled obliquely inward. *Filaments* 3–5 mm long, free for the upper 1 mm; *anthers* 4–5 mm long. *Style branches* ca. 6 mm long, crests 3–5(–8) mm, narrowly triangular. *Capsule* clavate, ca. 1.5 cm long; *seeds* many, angular. Chromosome number $2n = 12$.

Flowering time: October to November.

Distribution: Sandy slopes and flats in coastal areas from the Darling district in the west to Knysna and Plettenberg Bay in the east; rarely on clay.—Fig. 32.

Moraea bellendenii is a common species along the Cape coast from the vicinity of Darling in the west to Plettenberg Bay in the east. It shows a marked preference for very sandy situations, though is occasionally found on clay. It is very closely allied to *M. tricuspidata*, and it is often difficult to distinguish the two when dry, as color is an important difference, *M. bellendenii* being bright yellow and *M. tricuspidata* white to cream colored. Small differences in size of floral parts can also be used as an aid to identification (see discussion of *M. tricuspidata*). *Moraea tricuspidata* has the same general distribution though it ex-

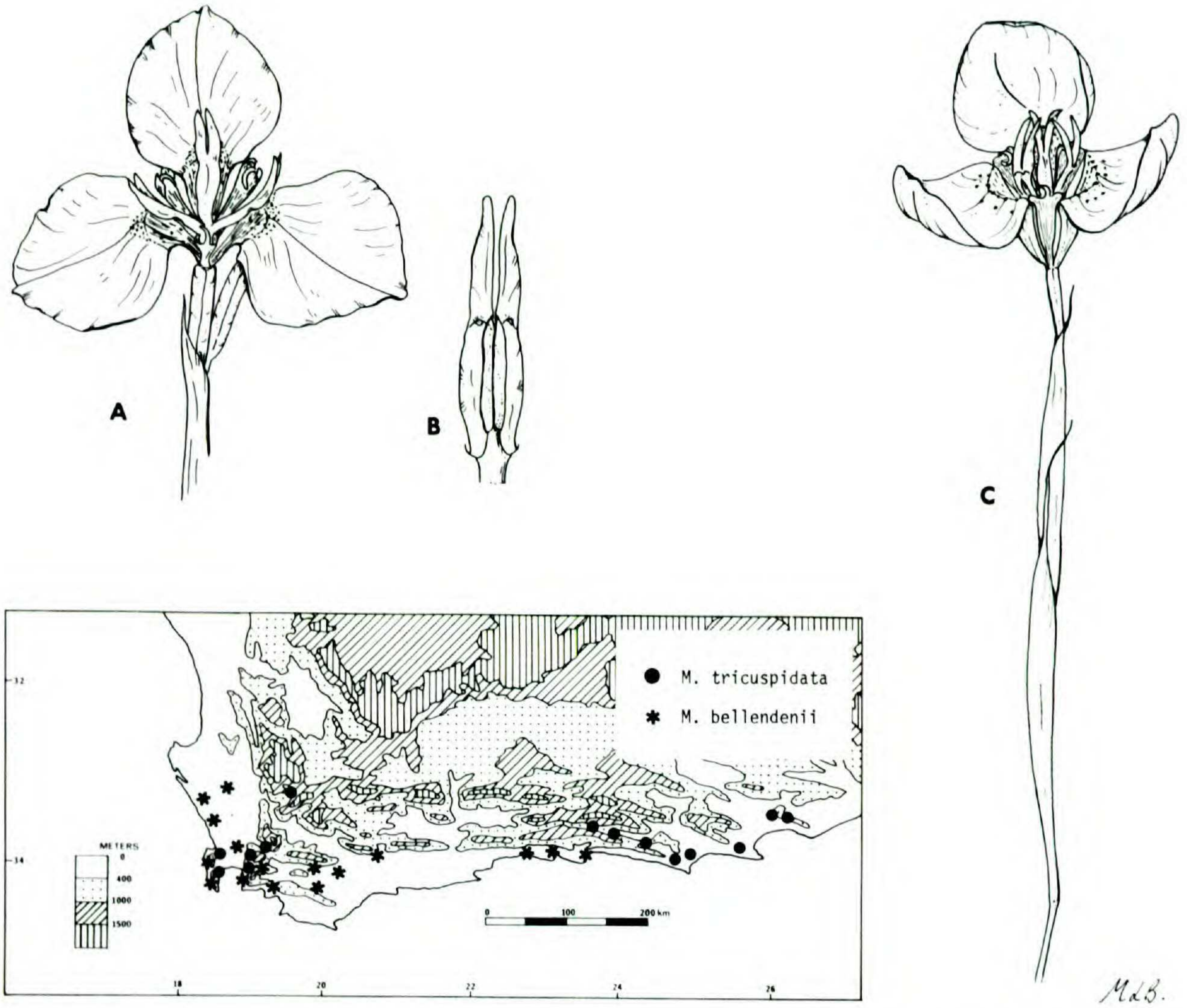

FIGURE 32. Morphology and distribution of *Moraea tricuspidata* and *M. bellendenii*.—A–B. *M. tricuspidata*.—A. Flower (life size).—B. Style branch and anther (×2).—C. *M. bellendenii*. Flower (life size).

tends further inland and also further east, as far as Grahamstown, and is found predominantly on clay soils.

Moraea bellendenii subsp. *cormifera* Goldbl. described recently (Goldblatt, 1973) from the Grahamstown area was misplaced under *M. bellendenii* and after a study of living plants, I have concluded that it is no more than a form of *M. tricuspidata*.

Moraea bellendenii was one of the first species of *Moraea* to be described, as *Vieusseuxia spiralis* de la Roche, and is the lectotype of *Vieusseuxia*. *Moraea spiralis* L.f. (= *Aristea*), however, bars the transfer of *V. spiralis* to *Moraea*.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Mamre hills (AD), *Wasserfall 439* (NBG, STE). Waylands, Darling, *Barker 720* (BOL, NBG). Oudepos, Darling, *Barker 10786* (NBG). Hills round Darling, *Bolus s.n.* (BOL). Near Moorreesburg (BA), *Bolus 9987* (BOL). Lions Head, Cape Peninsula (CD), *Bolus 8024* (BOL, GRA); *Tyson 2485* (SAM); *Levyns s.n.* (SAM-52930); *MacOwan in Herb Aust. Afr. 1965* (BOL, SAM, UPS). Camps Bay, Cape Peninsula, *Wolley Dod 3138* (BOL); *Marloth 234* (BOL); *Cassidy 249* (NBG); *Lewis 940* (SAM). Tygerberg, Bellville (DC), *Barker 8436* (NBG). Sewefontein, above Kuils River, *Oliver 4724* (STE). Joostenberg (DD), *Esterhuysen 15985* (BOL, NBG); *Lewis 5905* (NBG). Uitkyk hill, Stellenbosch, *Gillett 1829* (STE).

33.19 (Worcester): Near Laken Vlei (AC), *Phillips 2067* (SAM).

34.18 (Simonstown): Llandudno, Cape Peninsula (AB), *Lewis 941* (SAM); *Barker 3237* (NBG). Kogel Bay (BB), *Werdermann & Oberdieck 287* (PRE).

34.19 (Caledon): Elgin (AA), *L. Bolus s.n.* (BOL-19149). Houw Hoek, *Schlechter 2584* (PRE). Near Hawston, Bot R. valley, *van Niekerk 802* (BOL); *Goldblatt 676* (BOL). Caledon (AB), *Ecklon s.n.* (S); *Leipoldt 3567* (BOL). Near Onrust (AC), *Gillett 4400* (BOL). Greyton (BA), *Bayliss 4015* (BOL, NBG, MO). Rivier Zonder End (BB), *Barker 1337* (NBG); *Zeyher 4081* (K, S, SAM).

34.20 (Bredasdorp): Suurbraak, near Tradouw Pass road (BA), *Lewis 5652* (NBG).

34.22 (Mossel Bay): Near Belvedere Church, Knysna (BB), *Duthie 1137* (BOL). Ruigte vlei, *Fourcade 1554* (BOL, GRA, PRE).

34.23 (Knysna): Leisure Isle, Knysna (AA), *Cassidy 220* (NBG). Near Keurbooms River, Plettenberg Bay (AB), *Mauve 4570* (PRE); *Goldblatt 2911* (MO).

46. **Moraea neopavonia** Foster, Contr. Gray Herb. 165: 107. 1947, nom. nov. pro *M. pavonia* (L.f.) Ker. TYPE: As for *Iris pavonia* L.f.—FIG. 33A–C.

Iris pavonia L.f., Suppl. Pl. 98. 1781. TYPE: South Africa, Cape, Swartland hills, *Thunberg s.n.* (Herb. Thunberg 1148A, UPS, lectotype).

Moraea pavonia (L.f.) Ker, Ann. Bot. (König & Sims) 1: 240. 1805; Baker, Fl. Cap. 6: 23. 1896, excl. vars., hom. illeg., non *M. pavonia* (L.f.) Thunb., 1787.

Vieusseuxia pavonia (L.f.) DC., Ann. Mus. Natl. Hist. Nat. 2: 139. 1803.

Plants slender, 30–60 cm high. *Corms* ca. 1 cm in diameter; tunics brown, the inner fibers fine, the outer coarse. *Leaf* solitary, basal, linear, sparsely pubescent on the outer surface, exceeding the inflorescence. *Stem* finely pubescent, simple or 1-branched. *Spathes* herbaceous below, dry above with long, dark brown, attenuate apices; inner spathe 4.5–7(–8) cm long, the outer ca. ⅔ the length of the inner. *Flowers* orange, marked with a navy blue to green nectar guide and often speckled in the center; outer tepals 2.2–4.0 cm long, the limb 1.5–3 cm long, broadly ovate, to 2–3 cm wide, spreading; inner tepals 1.5–2.5 cm long, ± outspread, entire and narrowly lanceolate or weakly to distinctly trifid with 2 small obtuse lateral lobes and a long central cusp. *Filaments* ca. 4 mm long, free in the upper 1 mm; *anthers* ca. 1 cm long, exceeding the style crests. *Style branches* 5 mm long, the crests 1–2 mm, triangular. *Capsule* cylindrical, 2–4 cm long; *seeds* angled, with spongy, inflated testa. Chromosome number $2n = 12$.

Flowering time: Late September.

Distribution: Gravelly clay slopes and flats near the Berg River between Paarl and Piketberg.—FIG. 33.

The very striking *Moraea neopavonia* is a rare species, known today from only two localities. It was probably never common, but was certainly more widespread in the past. Its recorded range extends along the Berg River from near Paarl to beyond the Piketberg, an area now intensely cultivated and relict stands occur only on stony patches or steep banks. In view of its great beauty and potential for horticulture, the species should be protected from further extension of agriculture into its last remaining habitats.

Moraea neopavonia is one of several species in which the inner tepals vary from entire to tricuspidate. The entire condition is presumably ancestral and the occurrence of this feature places *M. neopavonia* at the beginning of the "peacock" group of species, those with brightly colored, very broad outer tepals and conspicuous nectar guides. In *M. neopavonia*, the bright orange to red flowers

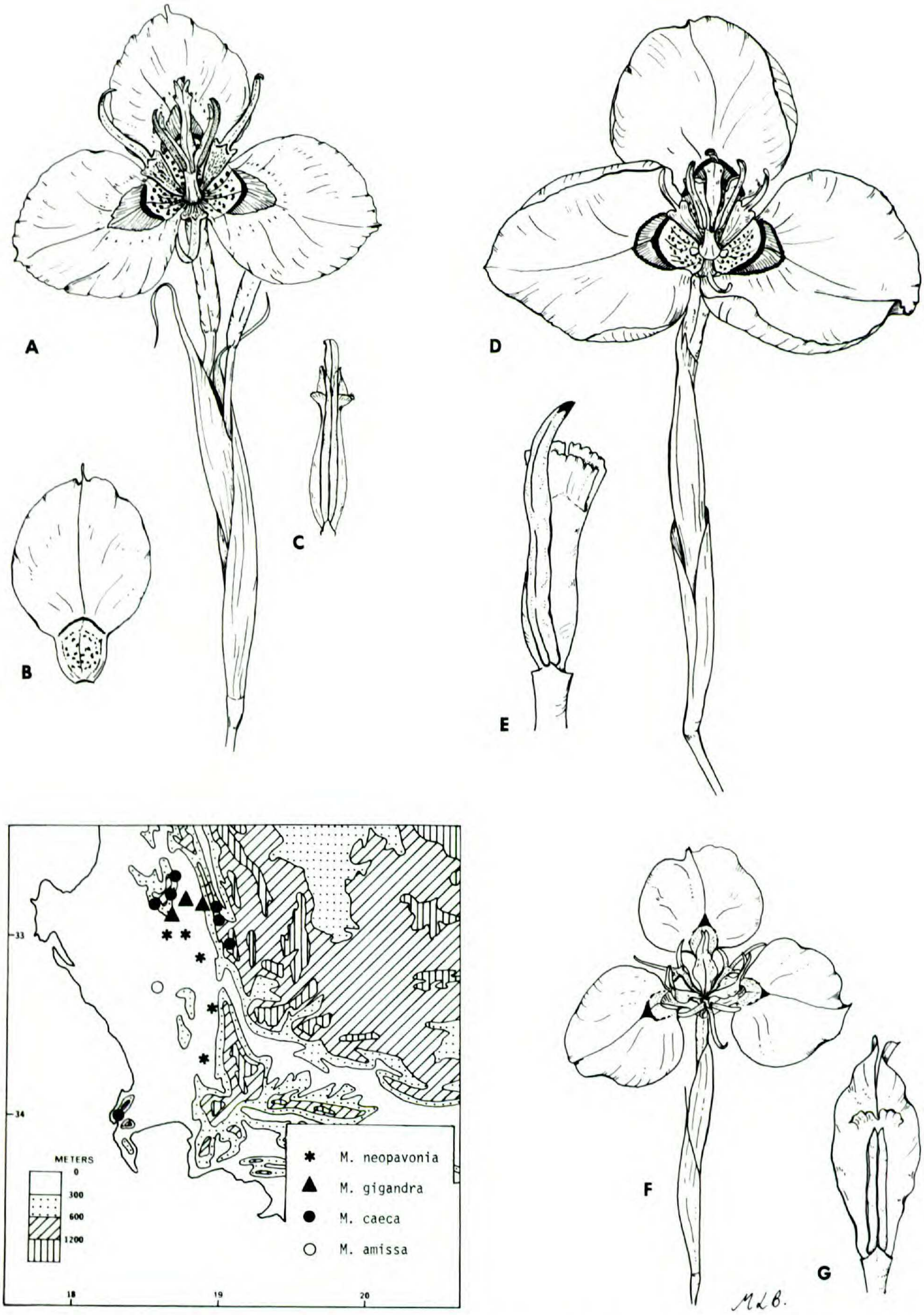

FIGURE 33. Distribution and/or floral morphology of *Moraea neopavonia*, *M. gigandra*, *M. caeca*, and *M. amissa*.—A–C. *M. neopavonia*.—A. Flower (life size).—B. Tepal (life size).—C. Style branch and anther (enlarged).—D–E. *M. gigandra*.—D. Flower (life size).—E. Style branch and stamen (enlarged).—F–G. *M. caeca*.—F. Flower (life size).—G. Style branch and stamen (enlarged).

are marked with navy blue or peacock green. Apart from its unusual flower color, the species is distinctive in having very large anthers which exceed the stigmas and style crests.

SOUTH AFRICA. CAPE: 32.18 (Clanwilliam): Banks of Berg River near Piketberg (DC), *Schlechter 5263* (BOL, K, NBG, PRE). Near Berg River bridge (DD), *Salter 3666* (BOL, K); *Barnard s.n.* (BOL, K); *Goldblatt 654* (BOL).

33.18 (Cape Town): NE slopes of Heuningberg near Halfmanshof (BB), *Goldblatt 655, 685* (both BOL, MO). Near the potteries at Paarl (DD), *Middlemost 1714* (NBG).

33.19 (Worcester): Hermon–Tulbagh road (AC), *Mauve 4647* (PRE).

Without precise locality: Cape, *Thunberg s.n.* (S, UPS).

47. **Moraea gigandra** L. Bol., S. African Gard. 17: 418. 1927. TYPE: South Africa, Cape, precise locality unknown, *Metelerkamp s.n.* (BOL, holotype). —FIG. 33D–E.

Plants 20–40 cm high, usually unbranched. *Corms* ca. 1.5 cm in diameter; tunics of fine inner fibers and coarse woody outer fibers. *Leaf* solitary, basal, linear, sparsely pubescent or glabrous, equal to or exceeding the inflorescence. *Stem* finely pubescent, simple or bearing 1 branch. *Spathes* herbaceous below, dry above with dark brown attenuate apices; inner spathe 5–8 cm long, the outer 3–5 cm. *Flowers* large, purple, white or cream with a dark, narrow nectar guide; outer tepals 3–4.5 cm long with a broad, short claw ca. 6 mm long and a very broad spreading limb, ca. 3.5 cm wide; inner tepals 0.9–1.5 cm long, tricuspidate with 2 short lateral lobes and a longer, ± outspread central cusp. *Filaments* 2–4 mm long, free near the apex; *anthers* very large, 1.3–1.5 cm long, much exceeding the style crests. *Style branches* ca. 6 mm long, 2 mm wide, the crests minute, barely exceeding the large stigma lobe. *Capsule* 2–3 cm long, cylindrical; *seeds* unknown. Chromosome number $2n = 12$.

Flowering time: Late September, October.

Distribution: Clay soils, in the plains between the Piketberg and the Olifants River Mountains, north of the Berg River.—FIG. 33.

Once common north of the Berg River in the broad valley between the Piketberg and Olifants River Mountains, *Moraea gigandra* is now on the verge of extinction. Its habitat, the rich clay soil of this area, is now almost entirely given over to grain cultivation, and it survives in only a few isolated places, unsuitable to the plough.

Moraea gigandra has one of the largest and most striking flowers in the genus, with the broad shortly clawed outer tepals as long as 4.5 cm. Blue purple flowers are most frequent, but white and cream forms also occur. The flowers are distinctive not only in size, but also for their extraordinarily long anthers which reach 1.5 cm in length, much exceeding the stigma. The style crests are barely developed and are about as long as the stigmatic lip.

This comparatively late-flowering species was only brought to the attention of science in 1927, though it was evidently known in Europe in the eighteenth century. A manuscript description in the hand of Daniel de la Roche, who described the genus *Vieusseuxia*, attests to this little known fact (Goldblatt & Barnard, 1970). Today *M. gigandra* is cultivated by a few people in South Africa and also in New Zealand where it thrives.

SOUTH AFRICA. CAPE: 32.18 (Clanwilliam): Near Piketberg (DD), *H. Bolus 13654* (BOL). Piketberg, *Hofmeyr s.n.* (BOL-17546); *van der Spuy 39* (BOL); *Lewis Grant 3465* (MO). 4 km N of Piketberg on road to Pools, *L. Bolus s.n.* (BOL-31296). Hilltop near Berg River bridge, *Barnard 241* (BOL). Nurust farm 10 km N of Porterville, ca. 8 km from the mountains, *Loubser 2105* (BOL, NBG).

48. **Moraea caeca** Barnard ex Goldbl., Ann. Missouri Bot. Gard. 63: 21. 1976. TYPE: South Africa, Cape, top of Dasklip Pass near Porterville, *Goldblatt 678* (BOL, holotype; K, MO, PRE, S, isotypes).—FIG. 33F–G.

Plants slender, 20–40 cm high. *Corm* ca. 1 cm in diameter; the tunics light brown, fibrous. *Leaf* solitary, linear, glabrous, exceeding the inflorescence. *Stem* glabrous, occasionally pubescent, occasionally 1-branched, the branches held close to the axis. *Spathes* herbaceous or dry above with brown attenuate apices; inner spathe ca. 5 cm long, the outer to ca. 2.5 cm. *Flowers* mauve lilac with a small yellow or black nectar guide; outer tepals spreading, 2.3–2.8 cm long with an erect, channelled, pubescent claw 8–12 mm long and a broadly ovate, spreading limb, to 1.8–2.2 cm wide; inner tepals tricuspidate, channelled, the central cusp 5–8 mm long, the laterals to 2 mm. *Filaments* 2–3 mm long, united at least in the lower half; *anthers* dark, ca. 5 mm long. *Style branches* ca. 5 mm long, the crests acute to obtuse, to 7 mm long. *Capsule* clavate, to 1.5 cm; *seeds* angular. Chromosome number $2n = 12$.

Flowering time: Late September and October.

Distribution: Found only in mountainous areas in the Piketberg and Twenty Four Rivers Mountains as well as locally on the Cape Peninsula.—FIG. 33.

Though clearly a member of the "peacock" alliance, *Moraea caeca* lacks the conspicuous nectar guide characteristic of the group. Instead of the usual dark crescent surrounding a yellow "eye," the nectar guide is most often a small black dot. The tepals are also less brightly colored than other species in the group, being a plain pale lilac mauve. *Moraea caeca* is the only species in the group that has a montane distribution, and it occurs on sandy soils on the Piketberg, the mountains above Porterville, and locally on the Karbonkelberg on the Cape Peninsula.

Typically the stem and leaves are quite glabrous, but a collection from the Groot Winterhoek (*Haynes 858*) is conspicuously villous. The flowers of this collection are somewhat larger than the usual, but otherwise conform in color and marking to other populations. *Moraea caeca* is probably most closely related to *M. villosa* and the rare and almost extinct *M. aristata*, which occur in the lowland areas below the mountains on which *M. caeca* grows.

SOUTH AFRICA. CAPE: 32.18 (Clanwilliam): Kloof on SW side of Piketberg (DC), *Barnard s.n.* (BOL). Moutons Valei, *Marloth 11509* (PRE). Hills NW of Moutons Vlei, *Pillans 7488* (BOL). Piketberg (DD), *Vlok s.n.* (NBG-58948). Beyond Piketberg on Redelinghuys road, *Barnard s.n.* (SAM-52394, BOL).

32.19 (Wuppertal): Dasklip (Cardouw) Pass above Porterville (CC), *Barker 7599* (NBG, STE); *Esterhuysen 16211* (BOL); *Goldblatt 678* (BOL, MO, K, PRE). Mountain above Porterville, *Loubser 856* (NBG).

33.19 (Worcester): Driebosch, Groot Winterhoek (AA), *Haynes 858* (STE).

34.18 (Simonstown): Karbonkelberg, Cape Peninsula (AA), *Salter 3288* (BM).

49. **Moraea aristata** (de la Roche) Aschers. & Graebn., Syn. Mitteleur. Fl. 3: 518. 1906.—FIG. 34A.

Vieusseuxia aristata de la Roche, Diss. 33. 1766. TYPE: South Africa, Cape, exact locality unknown (cult. Europe), *Van Royen s.n.* (Herb. Van Royen, L, lectotype).

V. glaucopis D.C. in Redouté, Lil. *tab. 42.* 1803; Ann. Mus. Natl. Hist. Nat. 2: 141, *tab. 42.* 1803. TYPE: Illustration in Redoubté, Lil. *tab. 42.*

Moraea glaucopis (D.C.) Drapiez,[8] "Encyc. 4" Dict. Class. Sci. Nat. 7: 478. 1841; Baker, Fl. Cap. 6: 23. 1896.

M. candida Baker, Handbook Irid. 59. 1892, nom. nov. pro *Vieusseuxia fugax* de la Roche.

Ferraria ocellaris Salisb., Prodr. Stirp. 41. 1796, nom. nov. pro *Iris pavonia* var. TYPE: Illustration in Bot. Mag. *tab. 168.* 1791.

Moraea tricuspis (Thunb.) Ker var. *ocellata* D. Don, Br. Fl. Gard., ser 2. 3, *tab. 249.* 1834. TYPE: Illustration in Br. Fl. Gard., ser 2. *tab. 249.*

Plants 25–35 cm high. *Corms* ca. 1.5 cm in diameter; tunics of pale fibers. *Leaf* solitary, linear, glabrous, basal, exceeding the inflorescence. *Stem* glabrous, occasionally 1-branched. *Spathes* herbaceous, dry above with dark brown, attenuate apices; inner spathe 5–7 cm long, the outer ca. half the length of the inner. *Flowers* white with prominent nectar guide variously marked with concentric crescents of black, blue violet, or green; outer tepals 3–3.5 cm long, the claw heavily bearded, ca. 1.2 cm long, the limb very broad, spreading, ca. 2 cm long and to 2.5 cm wide; inner tepals 1.5–2 cm long, tricuspidate, the lateral lobes short, obtuse, the central cusp long, spreading. *Filaments* 3–4 mm long, free near the apex only; *anthers* ca. 5 mm long. *Style branches* ca. 7 mm long, the crests 7 mm long, triangular. *Capsule* clavate-cylindrical, 1.5–2 cm long; *seeds* angled, with a spongy testa. Chromosome number $2n = 12$.

Flowering time: September.

Distribution: Known only from the Royal Observatory grounds on the Liesbeek River, Cape Town; in clay soil but more widespread in the past.—FIG. 34.

It is no exaggeration to say that *Moraea aristata* is far more common in European herbaria than it is in the wild, and it is in fact close to extinction. This striking white-flowered, blue-eyed member of the "peacock" alliance was never widespread, and the early records suggest it grew only on clay slopes and flats in the northern Cape Peninsula, between Cape Town and Rondebosch. Today there is little open land here, but *M. aristata* still survives on the grounds of the Royal Observatory in Cape Town, along the Liesbeek River. Insufficient individuals remain to constitute a viable population, few plants producing flowers, and less seed.

There is no record of how *M. aristata* reached Europe, but it was in cultivation in Holland during the mid eighteenth century. It was first described in 1766 by Daniel de la Roche, pupil of the famous Dutch botanist Van Royen, who assigned it to the genus *Vieusseuxia*. A printer's error, transposing the epithets of *V. aristata* and a second species *V. fugax* opposite their descriptions in de la Roche's published Dissertation (Goldblatt & Barnard, 1970) subsequently led to some confusion and caused some botanists to reject both species. Although I had in the past been uncertain of the identity of *M. aristata* (Goldblatt & Barnard, 1970), close study has removed this doubt.

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[8] This combination is often incorrectly attributed to Baker, e.g., Baker, Handbook Irid. 59. 1892.

The species was collected later by Thunberg in the 1770s and specimens in his collection at Uppsala bear the epithet "*tricuspis*." These specimens are probably Thunberg's *Iris tricuspis* var. *alba*, the typical variety which is now recognized under the younger Linnaeus's epithet, *M. tricuspidata* (L.f.) Lewis (see discussion under this species). Lewis (1948), who rejected *M. aristata* on grounds of nomenclatural confusion, identified this species with *M. tricuspidata*, a determination not followed here. The discussion under *M. tricuspidata* deals with this situation in detail.

In the later eighteenth century all the so-called "peacock" moraeas were treated as *Moraea* (or *Vieusseuxia*) *pavonia*: thus *M. aristata* appears in the *Botanical Magazine* under this name. Salisbury recognized the illustration as representing a different species, which he named *Ferraria ocellaris*. Yet another epithet was provided, this time by De Candolle, in 1803, who called the plant *Vieusseuxia glaucopis*, and it is known as *M. glaucopis* today in Europe, where it is occasionally grown for ornament.

Moraea aristata is very closely related to the widespread *M. villosa* but differs not only in flower color and markings, but also in having an entirely glabrous stem and leaf. It is diploid with $2n = 12$, in contrast to *M. villosa* in which only polyploid populations are known.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Royal Observatory grounds (CD), *Compton 16041* (NBG); *Leighton 552* (BOL, SAM); *Salter 8488* (SAM); *Adamson 2583* (SAM); *Zeyher 5017* (SAM); *Davis s.n.* (SAM-60132). Foot of Devils Peak, *Thunberg s.n.* (UPS); *Drège s.n.* (GRA): *Pappe s.n.* (S).

Without precise locality: *Oldenburg* (S); *Ecklon* (S); *Thunberg* (C, S, UPS); *Herb. Gay* (K).

50. **Moraea amissa** Goldbl., sp. nov. TYPE: South Africa, Cape, Malmesbury district, 10 km NW of Malmesbury, *Acocks 20739* (PRE, holotype).

Planta gracilis, ad 30 cm alta. *Folium* solitarium basale, canaliculatum. *Caulis* simplex. *Spatha* herbacea, brunnea supra, interiora ca. 4 cm longa, exteriora ca. dimidia. *Flores* violacei; tepala exteriora 1.8–2.0 cm longa, limbus ca. 1.2 cm longus, ad 1.3 cm latus, effusus; tepala interiora ± lanceolata vel ± tricuspidata, ad 1.5 cm longa. *Filamenta* 3–4 mm longa, libera propre apicem, pubescentia ad base. *Rami styli* ca. 5 mm longa, cristae ad 4 mm.

Plants slender, ca. 30 cm high. *Corm* not known. *Leaf* solitary, basal, linear, canaliculate, glabrous, exceeding the inflorescence, 1.5–2 mm wide. *Stem* erect, glabrous, simple. *Spathes* herbaceous with dry upper margins, the apices attenuate, dark brown; inner spathe ca. 4 cm long, the outer ca. half the inner. *Flowers* violet with a darker nectar guide lined with white; outer tepals 1.8–2.0 cm long, the claw ca. 0.8 cm, the limb, outspread, to 1.3 cm wide; inner tepals either entire, ± lanceolate or ± tricuspidate, to 1.5 cm long. *Filaments* 3–4 mm long, free near the apex only, pubescent at the base; *anthers* 4 mm long. *Style branches* ca. 5 mm long, the crests to 4 mm. *Capsule* and *seed* unknown. Chromosome number unknown.

Flowering time: Early October.

Distribution: Local in sandstone outcrop, northwest of Malmesbury.—FIG. 33.

Collected first in 1959 by J. P. H. Acocks, *Moraea amissa* was overlooked for some time, or only examined superficially. It was discovered some 10 km northwest of Malmesbury in an area of sandstone outcrops, now partly under cultivation. A search for this species by me in 1974 proved fruitless, and it is feared that this obviously rare plant may be extinct.

Surprising as it is to find an undescribed species from the Malmesbury district, a very well collected area, there can be no doubt that *M. amissa* is distinct from its suggested allies, *M. incurva* and *M. unguiculata.* Its very broad outer tepals are reminiscent of *M. villosa* though the flower is much smaller. The inner tepals are either entire or imperfectly tricuspidate and thus seem rather like those of *M. incurva.* This similarity is, however, superficial, and *M. amissa* is placed in section *Vieusseuxia* among the so-called "peacock moraeas," where the small flower, glabrous stem and leaf, and peculiar inner tepals distinguish it.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): 10 km NW of Malmesbury (BC), *Acocks 20739* (PRE).

51. **Moraea villosa** (Ker) Ker, Ann. Bot. (König & Sims) 1: 240. 1805.—FIG. 34E–F.

Iris villosa Ker, Bot. Mag. *tab. 571.* 1802. TYPE: Illustration in Bot. Mag. *tab. 571.*
Vieusseuxia villosa (Ker) Spreng., Syst. Veg. 1: 165. 1825.
Moraea pavonia (L.f.) Ker var. *villosa* (Ker) Baker, Fl. Cap. 6: 24. 1896.
Vieusseuxia aristata sensu Houtt., Handleid. 12: 105, *tab. 80.* 1780.

Plants (15–)20–40 cm high, often branched. *Corm* 1–1.5 cm in diameter; tunics of finely fibrous inner layers and coarse, almost woody, outer layers. *Leaf* solitary, linear, basal, usually pubescent on the outer surface, occasionally on the margins only, or rarely glabrous, exceeding the inflorescence. *Stem* villous, simple or 1–2-branched. *Spathes* herbaceous or dry above with brown, attenuate apices; inner spathe 4–6 cm long, the outer 2.5–4 cm long. *Flowers* various shades of purple, lilac, pink or occasionally cream to pale green with a prominent yellow nectar guide circled by a dark, contrasting color; outer tepals 3–4 cm long, the claw 0.8–1.2 cm, erect, the limb 2–2.5 cm wide, spreading; inner tepals 1.6–3.0 cm long, tricuspidate with 2 short lateral lobes, and a long ± spreading central acute cusp. *Filaments* ca. 5 mm long, free near the apex only; *anthers* 6–10 mm long, reaching the stigma or occasionally slightly exceeding it. *Style branches* 5–7 mm long, to 8 mm wide, the crests (2.5–)5–8 mm long, either well developed or fairly inconspicuous. *Capsule* cylindrical, 2–3 cm long; *seeds* angled with a spongy testa. Chromosome number $2n = 24$.

Flowering time: August to September.

Distribution: Western Cape between Olifants River Valley and Hottentots Holland, usually on clay soils.—FIG. 34.

Moraea villosa was probably known in Europe for as long as were *M. aristata* and *M. neopavonia*, though it was not initially recognized as distinct. It was almost certainly first recorded by Thunberg, who accorded it varietal status as *Iris tricuspis* var. *purpurea.* Ker was the first to recognize it as a separate species in 1803, and after initially assigning it to *Iris*, he transferred it to *Moraea* in 1805.

It is the most widespread of all the "peacock moraeas," occurring along the

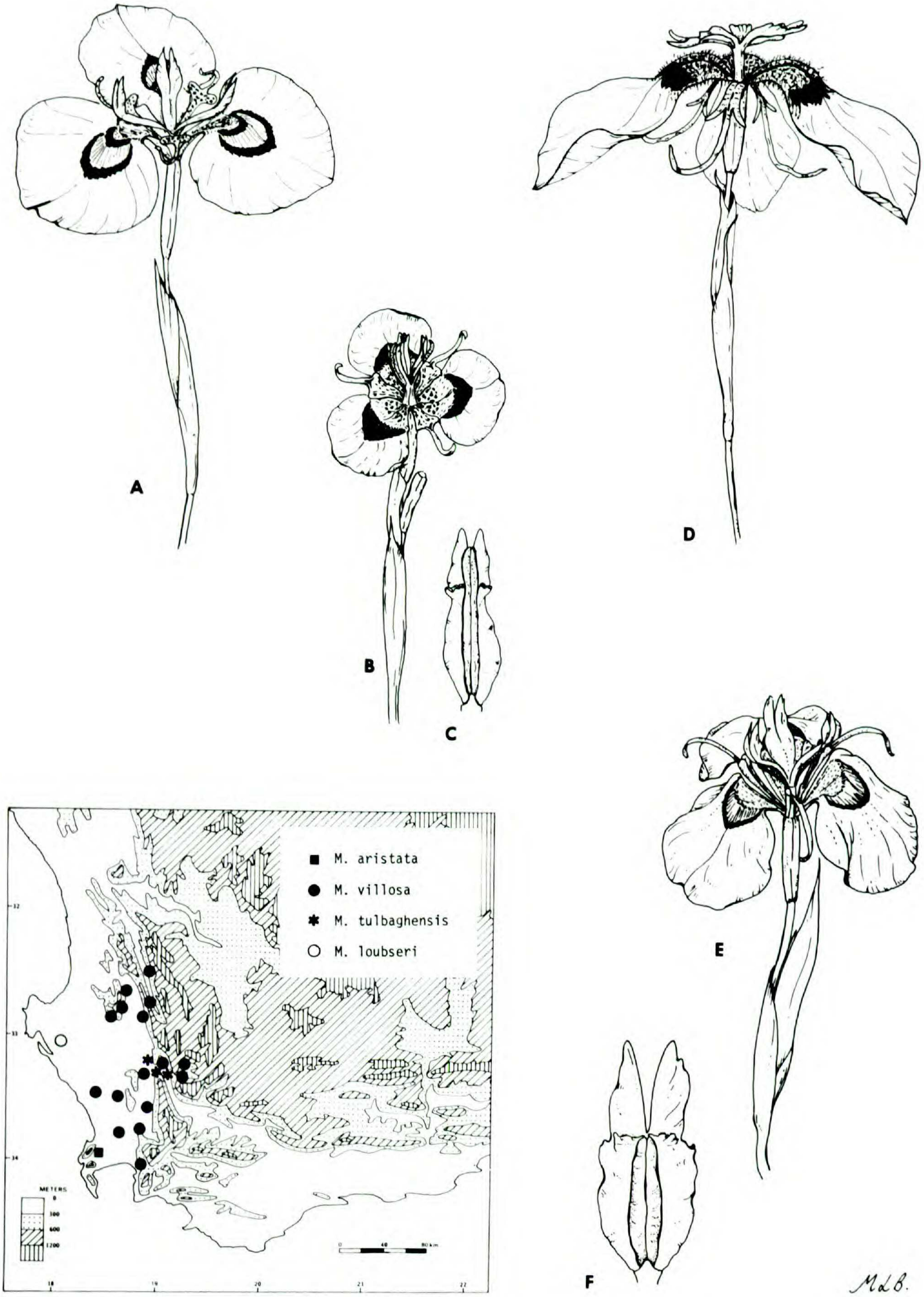

FIGURE 34. Distribution and floral morphology of "peacock moraeas."—A. *M. aristata.* Flower (life size).—B–C. *M. tulbaghensis.*—B. Flower (life size).—C. Style branch and anther (×3).—D. *M. loubseri.* Flower (life size).—E–F. *M. villosa.*—E. Flower (life size)—F. Style branch and anther (×3).

western Cape coastal belt from the Olifants River Valley, south to Sir Lowrys Pass, and it is common in the Tulbagh and Ceres districts. All populations examined cytologically have been found to be tetraploid, $2n = 24$, and the species may well be of allotetraploid origin.

Moraea villosa is somewhat variable in flower color; many populations have purple flowers with a navy, green, and yellow nectar guide, while others, notably in the Ceres area, have white, cream, pink, or rose flowers with contrasting markings, as well as the more usual purple color. The invariably pubescent stem and usually villous leaf, when taken together with flower color and size, are quite characteristic and distinguish *M. villosa* from its close allies, the glabrous *M. aristata*, and smaller, orange-flowered *M. tulbaghensis*.

SOUTH AFRICA. CAPE: 32.18 (Clanwilliam): Burgher's farm, Redelinghuys road (DC), *Barnard 266* (BOL). Foot of Piketberg, NE end (DD), *Pillans 7677* (BOL). Near Piketberg, *H. Bolus 13654* (PRE). Renosterkop, Piketberg, *Marloth 11538* (PRE).

32.19 (Wuppertal): 8 km N of Citrusdal (CA), *Lewis 5200* (NBG). Grootfontein road, Olifants River Mts. (CC), *Oliver 3966* (K, STE).

33.18 (Cape Town): Near Darling (AD), *H. Bolus 12835* (BOL). Near Porterville (BB), *Middlemost 1861* (BOL, NBG). Near Malmesbury (BC), *Lewis 1859* (SAM); *Barker 8050* (NBG). Near Agter Paarl (DB), *Reid sub Acocks 4918* (S). Paardeberg, *Salter 7667* (SAM). Wellington, *Lewis Grant 2390* (BR, M, MO). Fields near Durbanville (DC), *Esterhuysen 17511* (BOL). Near Klapmuts (DD), *Acocks 2169* (S).

33.19 (Worcester): Near Tulbagh (AC), *Garside 1537* (K); *Lewis Grant 2480* (BOL, BR, MO, PRE). Gouda, *Andrag s.n.* (STE-18578); (as Piketberg Road), *Guthrie s.n.* (NBG). Gydouw (AD), *Leipoldt 3007, 4079* (both BOL). Near Ceres, *H. Bolus 7340* (BOL); *Johnson 491* (NBG); Prince Alfreds Hamlet, *Lewis 2673* (SAM).

34.19 (Simonstown): Somerset West (BB), *Compton 13470* (NBG); *Leighton 248* (BOL). Near Gordons Bay, *H. Bolus s.n.* (BOL). Hottentots Holland, *Zeyher s.n.* (SAM-20600); *H. Bolus 6922* (BOL).

52. **Moraea tulbaghensis** L. Bol., S. African Gard. 22: 276. TYPE: South Africa, Cape, Saron, Tulbagh district, *L. Bolus s.n.* (BOL-16738).—FIG. 34B–C.

Plants 25–35 cm high, occasionally branched. *Corm* 1–1.5 cm in diameter; tunics of coarse, woody fibers. *Leaf* solitary, linear, basal, pubescent on the outer surface, usually exceeding the inflorescence. *Stem* villous, simple or 1-branched. *Spathes* herbaceous to dry above with dark attenuate apices; inner spathe 5–7 cm long, the outer ca. half the inner. *Flowers* much like *M. villosa* but bright orange, the nectar guide orange yellow, ringed with blue green; outer tepals ca. 2.4 cm long, the orange claw ca. 1 cm long, erect, bearded, the limb spreading, broad, to 2 cm wide; inner tepals 1.5–1.8 cm long, tricuspidate with 2 short lateral lobes and a long central ± spreading central cusp. *Filaments* ca. 5 mm long, free near the apex only; *anthers* 7–10 mm long, shortly exceeding the stigma lobes. *Style branches* ca. 7 mm long, to 3 mm wide, the crests triangular, ca. 2 mm long, inconspicuous. *Capsule* cylindrical, ca. 2 cm long; *seeds* large, angular, with a spongy testa. Chromosome number $2n = 24$.

Flowering time: September.

Distribution: Clay flats in the Tulbagh and Wellington districts of the southwestern Cape.—FIG. 34.

The brilliant orange-flowered *Moraea tulbaghensis* with its deep green and yellow nectar guide is morphologically very similar to *M. villosa*, and, except for color differences, the two can be distinguished only with difficulty. *Moraea tulbaghensis* has, in general, slightly smaller flowers and particularly short style crests, ca. 2 mm long, in contrast with a range from 3 to 6 mm in *M. villosa.* Many collections of *M. tulbaghensis* also have anthers which exceed the stigmas, and this feature, as well as the orange flower color, is reminiscent of *M. neopavonia.* The distinctly tricuspidate inner tepals of *M. tulbaghensis* serve to distinguish it from this species.

Like *M. villosa, M. tulbaghensis* is evidently a polyploid species. In view of the morphological similarities an allotetraploid origin seems likely, with parent species similar to *M. neopavonia* and a diploid species resembling *M. villosa,* such as *M. aristata* or possibly *M. caeca.*

Moraea tulbaghensis occurs locally in the Tulbagh area, both in the Tulbagh valley and to the west, between Gouda and Saron. It is rare, and because it flowers irregularly, it is not often collected.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Twenty Four Rivers near Gouda (BB), *Leighton s.n.* (BOL). Roadside outside Wellington (DB), *Reid sub Acocks 4917* (S).

33.19 (Worcester): Saron (AA), *L. Bolus s.n.* (BOL-16738); *Andrag s.n.* (STE-18877). Near Gouda (AC), *Leipoldt s.n.* (BOL-20766). Mts. near Tulbagh Kloof, *Stokoe s.n.* (SAM-63679). Roadside in clay soil, Tulbagh, *Cheeseman sub Acocks 4922* (S). Near Tulbagh, *Ecklon & Zeyher Irid. no. 39* (SAM, LD); *Lewis Grant 2472* (BOL, K, MO).

Locality unknown: Ex hort. Kirstenbosch, *Meterlerkamp s.n.* (BOL).

53. **Moraea loubseri** Goldbl., Fl. Pl. Africa 42: *tab. 1724.* 1977. TYPE: South Africa, Cape, Olifants Kop, Langebaan, *Goldblatt 2076* (MO, holotype; K, NBG, PRE, S, isotypes).—FIG. 34D.

Plants 15–20 cm high, usually 1-branched. *Corm* ca. 1 cm in diameter; tunics of pale, fairly coarse fibers. *Leaf* solitary, basal, linear, pubescent, usually exceeding the inflorescence. *Stem* minutely pubescent, usually bearing a single branch. *Spathes* herbaceous with brown attenuate apices; inner spathe 4–5 cm long, the outer 3–4 cm long. *Flowers* blue violet with black pubescent centers; outer tepals ca. 2.3 cm long, the claw broad, ca. 1 cm long, completely bearded with black hairs, the limb slightly reflexed, 1.4–2 cm at the widest point; inner tepals 1.5–2 cm long, acuminate, tricuspidate, with 2 short lateral lobes and a long, ± spreading to slightly reflexed central cusp. *Filaments* ca. 4 mm long, free in the upper third; *anthers* 5 mm long. *Style branches* ca. 6 mm long, the crests ca. 1 mm, triangular. *Capsule* and *seeds* unknown.

Flowering time: Late August to September.

Distribution: Sandy soil on the summit of Olifants Kop, Langebaan, southwestern Cape.—FIG. 34.

Moraea loubseri is yet another extremely localized southwestern Cape species, being known only from a single small hill, Olifants Kop, near Langebaan in the Saldanha Bay area. Most remarkably, it was first discovered as recently as 1973, when Olifants Kop was visited by amateur botanists just before quarrying was scheduled to begin at this site (Goldblatt, 1977). The hill has subsequently been partially excavated and it seems only a matter of time before the natural habitat of *M. loubseri* is entirely destroyed. Fortunately, authorities have been alerted to the situation and a small nature reserve may be set aside to preserve this plant. It has also been introduced to horticulture, and because of its beauty and relative ease of cultivation, it may become an established garden favorite.

The species is clearly allied to the "peacock" group, particularly *Moraea villosa* which it resembles in the pubescence of stem and leaf and in flower size. The blue color and remarkable black beard covering the claw and proximal part of the limb of the outer tepals is, however, so distinctive that confusion with any other species seems unlikely.

SOUTH AFRICA. CAPE: 33.18 (Cape Town): Olifants Kop near Langebaan (AA), *Goldblatt 2706* (K, MO, NBG, PRE, S); *Loubser 2228* (NBG).

V. Subgenus GRANDIFLORA

Subgenus **Grandiflora** Goldbl., Ann. Missouri Bot. Gard. 63: 8. 1976. TYPE: *Moraea spathulata* (L.f.) Klatt.

Plants medium to large, rarely branched. *Corm* tunics usually pale to brown and fibrous. *Prophylls* often distinctive, large, entire to fibrous, or irregularly broken, dark brown to pale. *Leaf* solitary, flat, canaliculate or revolute. *Flowers* usually large, usually yellow or white, blue purple in a few species; outer tepals spreading; inner tepals entire, and usually erect. *Style branches* and crests well developed. *Capsule* clavate-cylindrical; *seeds* large, flattened and triangular to discoid. Basic chromosome number, $x = 6$.

Distribution: Extending from the southern Cape through southern and tropical Africa to Ethiopia and Nigeria, found mainly in highland areas.

This subgenus, comprising about 22 species occurs mainly in regions of summer rainfall and is found throughout sub-Saharan Africa in highland areas. There is a remarkable degree of morphological uniformity in the group, all species having a very similar flower and vegetative form. Species have, however, become adapted to a variety of habitats and ecological niches and in this respect exhibit greater diversity than other subgenera of *Moraea*.

The basic chromosome number $x = 6$ is clearly specialized, which accords with the considerable specialization of the subgenus where the leaf is invariably solitary and the stem unbranched, except in the rarest of cases. The flowers are, however, quite typical for the genus, except in being large, but the flattened seeds are clearly specialized. Though subgenus *Grandiflora* shares the same basic chromosome number, $x = 6$, with subgenus *Vieusseuxia*, there is no reason to believe that they are related or have a common origin. As the two subgenera have become specialized in quite different ways, they are perhaps more likely to have evolved independently of one another.

54. **Moraea spathulata** (L.f.) Klatt.

This species occurs throughout the eastern mountains of South Africa, and extends along the coast southwards to the George district of the southern Cape. It is thus predominantly a summer-rainfall-area species, and as such was dealt with in detail in the treatment of *Moraea* for this area (Goldblatt, 1973: 250).

The type was collected by Thunberg in the southern part of its range, and only the typical subspecies occurs in the winter rainfall area.

EXCLUDED SPECIES

Of the many species of *Moraea* from the southern African winter rainfall region now regarded as belonging to other genera, only the following remain unidentified or have not already been placed in other genera.

Moraea capensis (Burm. f.) Klatt, Durand & Schinz, Consp. Fl. Afr. 5: 148. 1895.

This species was first described by Burman fil. as *Iris capensis*. The type specimen, in the Burman Herbarium, in the Delessert Herbarium, Geneva shows it to be *Iris xiphium* L., evidently in cultivation at the Cape in the eighteenth century.

Moraea crispa Thunb., Diss. de Moraea 13. 1787.

The identity of this species, collected by Thunberg, and still represented in his herbarium at Uppsala, remains a mystery. The species is clearly unifoliate, with a crisped and undulate basal leaf, and has an unbranched stem. Beyond the fact that the flowers were blue, nothing is known. The species is either a *Homeria* or a *Moraea*, but no plant is known in either genus with such leaf characters from the Roggeveld where the original gathering was made. This area is not particularly well collected, and plants matching the Thunberg collection may eventually be found so that the true identity of *M. crispa* can be established.

Moraea gigantea Klatt, Linnaea 35: 381. 1868.

This is a species of *Homeria* and will be assigned to this genus when my planned revision of *Homeria* is completed.

Moraea gracilis (Licht. ex R. & S.) Dietr., Sp. Pl., ed. 6, 1: 478. 1833.

Type material of this species, based on *Iris gracilis* Licht. ex R. & S., has not been located and in its absence must be excluded. The description of *Iris gracilis*, a plant collected by Lichtenstein on the Cape Peninsula, alone is not sufficient for determination.

Moraea juncea L., Sp. Pl., ed. 2: 59. 1762.

Known only from the brief Linnaean diagnosis, this species remains something of a mystery (Barnard & Goldblatt, 1975). As it cannot be identified with any known species or specimen, it must be excluded (see p. 693).

Moraea fasciculata Klatt, Abh. Naturf. Ges. Halle 15: 367.

Klatt intended this name for a form of what is here recognized as *M. falcifolia* Klatt. However, in citing *M. largiflora* Ker as a synonym, Klatt in effect makes the species superfluous. *Moraea largiflora* Ker does not exist, but is possibly a misspelling of *M. longiflora.*

Moraea minuta (L.f.) Ker, Ann. Bot. (König & Sims) 1: 241. 1805.

Based on *Iris minuta* L.f. and typified by specimens in the Thunberg Herbarium, *M. minuta* is readily identified as either *M. ciliata* or what is recognized here as *M. tricolor* Andr. Flowers of the type are preserved too poorly to pick out critical differences, and the descriptions given by Thunberg of both *Iris ciliata* and *I. minuta* are confusing. Both are reputed to have come from the Cape Peninsula, where *M. tricolor* is not recorded, and to have had yellow flowers, yet the only population of *M. ciliata* known to me in the area is blue flowered. *Iris minuta* is described as being glabrous, a characteristic of *M. tricolor,* but with narrow inner tepals, a feature of *M. ciliata.* The confusion cannot be resolved with the information presently at hand and the species must thus be rejected.

Moraea pritzeliana Diels, Bot. Jahrb. Syst. 44: 117. 1910.

Examination of the type at the Botanical Museum at Berlin-Dahlem shows this to be conspecific with *Gynandriris torta* (L. Bol.) Foster. As it is an earlier synonym, the following new combination is necessary:

Gynandriris pritzeliana (Diels) Goldbl., comb. nov.

Moraea pritzeliana Diels, Bot. Jahrb. Syst. 44: 117. 1910. TYPE: South Africa, Cape, Calvina district, *Diels 694* (B, holotype).
Moraea torta L. Bol., S. African Gard. 17: 418. 1927.
Gynandriris torta (L. Bol.) Foster, Contr. Gray Herb. 114: 41. 1936.

Moraea zeyheri Lehm., Ann. Sci. Nat. Bot., sér. 2, 6: 107. 1836.

The type specimen of this species, described by Lehman, has not been located, and in its absence identification of this species is not possible.

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INDEX OF LATIN NAMES

Numbers in **boldface** refer to descriptions; names in roman are recognized as valid; names in *italic* refer to synonyms and illegitimate names; numbers with asterisks (*) refer to names incidentally mentioned.

Acacia 669*
Aristea 676*, 679*, 768*
Barnardiella 660*, 661*
Belamcanda 661*, 679*
Bobartia 679*
Compositae 667*
Diaphane 680*
Dietes 657*, 659*, 660*, 661*, 663*, 676*, 677*, 679*, 680*, 695*
  iridioides (L.) Sweet ex Klatt 693 (footnote)
  vegeta (L.) N.E. Br. 677*, 693* (footnote), 695
Elytropappus rhinocerotis (L.f.) Less. 667*
Ericaceae 667*
Euryops 666*
Ferraria 661*, 679
  lugubris Salisb. 706, 707*
  ocellaris Salisb. 773, 774*
  tristis (L.f.) Salisb. 693
  undulata L. 692*
Freuchenia 681
  bulbifera Eckl. 687
Galaxia 660*, 661*
  peduncularis Beguinot 709
Gynandriris 660, 661*, 679*, 680*, 729*
  apetala (L.Bol.) Foster 729
  pritzeliana (Diels) Goldbl. 781
  sisyrinchium (L.) Parl. 660*
  stenocarpa (Schlecht.) Foster 729
  torta (L.Bol.) Foster 781
Hakea 669*
Helixyra 660*, 680*, 728, 729
  flava Salisb. 682*, 731
  longiflora 731
Hermodactylis 661*
Hexaglottis 660*, 661*, 679*, 680*
Homeria 660*, 661*, 671*, 679*, 680*, 739*, 763*, 780*
  elegans (Jacq.) Sweet 764*
  maculata Klatt 763, 764*
  simulans Baker 739
Hymenostigma 680*, 682
  schimperi Hochst. 682*
Iridaceae
  —subfam. Iridoideae 657, 659, 661
  —subfam. Ixioideae 670*, 672*
  —tribe Irideae 657, 659, 660, 661
  —subtribe Ferrariinae 661
  —subtribe Homeriinae 660, 661
  —subtribe Iridinae 660, 661
Iris 657*, 659*, 660*, 661*, 678*, 679*, 747*, 775*
  angusta Thunb. 740
  bituminosa L.f. 732
  capensis Burm. f. 780
  ciliata L.f. 711, 781*
  crispa L.f. 678*, 689*, 691*
  cristata Soland. 699
  edulis L.f. 725
  fugax Persoon 714
  gracilis Licht ex R. & S. 780
  hirsuta Licht. ex R. & S. 699
  longifolia Schneevoogt 725
  minuta L.f. 781
  mutila Licht. ex R. & S. 751, 754*
  papilionacea L.f. 699
  pavonia L.f. 769, 773
  plumaria Thunb. 706, 707*
  ramosa Thunb. 687
  ramosissima L.f. 687
  setacea Thunb. 678*
  setifolia L.f. 678*
  sisyrinchium L. 679*
  spathacea Thunb. 678*
  spathulata L.f. 678*
  tricuspidata L.f. 678*, 765
  tricuspis Thunb. 678*, 765
    —var. *alba* 766*, 774
    —var. *flava* 766*
    —var. minor 759
    —var. purpurea 766*, 775*
  tripetala L.f. 751
  tristis L.f. 678*, 693
  villosa Ker 775
  viscaria L.f. 735, 738*
  xiphium L. 780
Lapeirousia 666*
Leptospermum 669*
Moraea Miller
  —subgen. *Eumoraea* 687, 728
  —subgen. Grandiflora Goldbl. 661*, 662*, 663*, 666*, 671*, 672*, 674*, 675*, 687*, 740, **779**
  —subgen. *Helixyra* Salisb. ex Baker 680*
  —subgen. Monocephalae (Baker) Goldbl. 661*, 662*, 663*, 668*, 671*, 672*, 675*, 687*, **739**
  —subgen. Moraea 660*, 661*, 662*, 663*, 666*, 672*, 674*, 675*, **686**, 687*, 709*, 716, 726*
  —subgen. Vieusseuxia (de la Roche) Baker 661*, 662*, 663*, 671*, 672*, 674*, 676*, 687*, 726*, **745**, 749*, 779*
  —subgen. Visciramosa Goldbl. 661*, 662*, 663*, 666*, 667*, 672*, 675*, 687*, **732**, 739*, 740
  —sect. Acaules Baker 662*, 671*, 675*, **708**, 709*, 716

—sect. *Corymbosae* Baker 687
—sect. Deserticola Goldbl. 661*, 662*, 663*, 666*, 668*, 671*, 675*, **716**, 723*
—sect. Monocephalae Baker 740
—sect. Moraea 662*, **687**, 707*, 709*
—sect. Polyanthes Goldbl. 661*, 662*, 663*, 666*, 671*, **745**, 749*, 750*, 751*
—sect. Subracemosae Baker 662*, 668*, 671*, 675*, **723**
—sect. Tubiflora Goldbl. 662*, 675*, **728**, 732*
—sect. Vieusseuxia 662*, 663*, 668*, 674*, **749**, 758*, 775*
algoensis Goldbl. **750**, Fig. 27, 28
amabilis Diels 751, 754*
amissa Goldbl. 662*, 668*, 674*, **774**, Fig. 33
angusta (Thunb.) Ker 662*, 675*, 739, **740**, 744*, 759*, Fig. 25
anomala Lewis 662*, 668*, 740*, **743**, 744*, Fig. 25
apetala L. Bol. 729
arenaria Baker 701, 702*, 703*, 705*, 706*
aristata (de la Roche) Aschers. & Graebn. 662*, 668*, 674*, 676*, 677*, 765*, 766*, 772*, **773**, 775*, 777*, 778*, Fig. 34
barbigera Salisb. 714
barkerae Goldbl. 662*, 663*, 669*, 674*, 750*, 755*, **757**, Fig. 4, 28, 29
barnardii L. Bol. 662*, 669*, 674*, 753*, **756**, Fig. 28, 29
bellendenii (Sweet) N.E. Br. 662*, 676*, 681, 745, 749, 761*, 765*, 766*, **767**, Fig. 32
—subsp. *cormifera* Goldbl. 765, 766*, 768*
bipartita L. Bol. 746, 747*
bituminosa (L.f.) Ker 662*, 672*, **732**, 735*, 737*, Fig. 23
bolusii Baker 662*, 671*, 672*, 716, 718*, 720*, **721**, Fig. 19, 20
bubalina Goldbl. 662*, 672*, 732*, **733**, Fig. 23
bulbifera Jacq. 687
caeca Barnard ex Goldbl. 662*, 671*, **772**, 778*, Fig. 33
candida Baker 773
capensis (Burm. f.) Klatt 780
carsonii Baker 746*, 751*
ceresiana Lewis 759
ciliata (L.f.) Ker 662*, 664*, 667*, 672*, 708*, 709*, **711**, 714*, 716*, 781, Fig. 16, 17
ciliata var. *barbigera* (Salisb.) Baker 715
ciliata var. *tricolor* (Andr.) Baker 714
confusa Lewis 765, 766*
cooperi Baker 662*, 672*, 673*, 674*, 728*, **729**, 732*, Fig. 22
corniculata Lam. 725
crispa (L.f.) Ker 689, 692*
crispa Thunb. 679*, 689*, 690*, 780
—var. *rectifolia* Baker 689, 690*
debilis Goldbl. 662*, 669*, 672*, **755**, Fig. 28, 29
decussata Klatt 689, 692*
diphylla Baker 725, 726*
duthieana L. Bol. 715
edulis (L.f.) Ker 676*, 721*, 724*, 725
—var. *gracilis* Baker 724
elliotii Baker 746*, 750*, 751*
elsiae Goldbl. 662*, 732*, 737*, **739**, Fig. 23
falcifolia Klatt 658*, 660*, 662*, 664*, 672*, 680*, **709**, 780*, Fig. 15
fasciculata Klatt 709, 780
fergusoniae L. Bol. 662*, 671*, 674*, 680*, **697**, 699*, 700*, Fig. 10, 11
filicaulis Baker 725, 726*
fimbriata Klatt 680*, 697, 699*
fimbriata Loisel 699*
framesii L. Bol. 701, 704*, 706*
fugax (de la Roche) Jacq. 662*, 664*, 671*, 674*, 675*, 676*, 679*, 697*, 719*, 721*, 723*, 724*, **725**, Fig. 4, 21
—var. *longifolia* (Schneevoogt) Baker 727*
fusca Baker 762
galaxioides Baker 709
gawleri Spreng. 662*, 664*, 667*, 671*, 675*, 678*, 688*, **689**, 693*, Fig. 6, 7
gigandra L. Bol. 662*, 669*, 672*, 675*, 677*, 764*, **771**, Fig. 33
gigantea Klatt 780
glaucopis (DC.) Drapiez 668*, 676*, 765*, 766*, 773, 774*
gracilenta Goldbl. 662*, 671*, 675*, 723*, **724**, 726*, Fig. 21
gracilis (Licht. ex R. & S.) Dietr. 780
hantamensis Klatt 711, 713*
hirsuta (Licht. ex R. & S.) Ker 699, 700*
inclinata Goldbl. 671*
inconspicua Goldbl. 662*, 664*, 674*, 675*, 732*, 733*, 735*, **737**, 739*, Fig. 24
incurva Lewis 662*, 668*, 674*, **756**, 758*, 775*, Fig. 29
indecora Goldbl. 662*, 663*, 675*, 687*, 693*, **695**, 701*, Fig. 9
insolens Goldbl. 662*, 667*, 668*, 675*, 757*, **763**, Fig. 31
iridioides L. 677*, 679*, 693*, 695
iriopetala L.f. 678*, 693, 706, 707*
—var. *juncea* (L.) L.f. 678*
juncea L. 676*, 677*, 678*, 693*, 694*, 695*, 780
juncea sensu N.E. Br. 693
largiflora Ker 780*, 781*
longiflora Ker 662*, 669*, 672*, 674*, 679*, 680*, 682*, 729*, **731**, 781*, Fig. 22
longifolia (Jacq.) Pers. 725*

longifolia (Schneevoogt) Sweet 725
loubseri Goldbl. 662*, 669*, 672*, **778**, Fig. 34
lugubris (Salisb.) Goldbl. 662*, 675*, **706**, Fig. 14
lurida Ker 662*, 667*, 679*, 681, 757*, **762**, 764*, 766*, Fig. 4, 31
macgregorii Goldbl. 662*, 663*, 668*, 669*, 675*, **719**, 723*, Fig. 19, 20
macrochlamys Baker 711, 712*
macronyx Lewis 662*, 671*, 672*, 711*, **714**, Fig. 17
maculata Sessé & Mociño 764*
margaretae Goldbl. 662*, 687*, 697*, 700*, **701**, Fig. 4, 10, 11
minuta (L.f.) Ker 712*, 781
mira Klatt 706, 707*, 708*
monophylla Baker 751
montana Schlecht. 762
namibensis Goldbl. 662*, **721**, Fig. 18
natalensis Baker 671*
neglecta Lewis 662*, 675*, 741*, 743*, **744**, Fig. 25
neopavonia Foster 662*, 669*, 672*, 674*, 675*, 757*, **769**, 775*, 778*, Fig. 33
nubigena Goldbl. 662*, 667*, 669*, 674*, **749**, Fig. 26
obtusa N.E. Br. 740
odora Salisb. 725
odorata Lewis 735, 737*, 738*
papilionacea (L.f.) Ker 662*, 671*, 672*, 687*, 693*, 697*, 698*, **699**, 701*, Fig. 10, 11
—var. *maythamiae* Lewis 699, 700*
pavonia (L.f.) Ker 769, 774*
—var. *lutea* (Ker) Baker 767
—var. *villosa* (Ker) Baker 775
pilosa Wendl. 699, 700*
plumaria (Thunb.) Ker 706, 708*
polyanthos L.f. 662*, 664*, 671*, 674*, 679*, 745*, **746**, Fig. 5, 26
polystachya (L.f.) Ker 658*, 662*, 663*, 671*, 672*, 674*, 745, **746**, 747*
pritzeliana Diels 781
punctata Baker 751
ramosa (Thunb.) Ker 687, 688
ramosissima (L.f.) Druce 662*, 667*, 671*, 672*, 674*, **687**, 690*, Fig. 6, 7
saxicola Goldbl. 662*, 663*, 666*, 671*, **717**, 720*, 721*, 723*, Fig. 4, 18
schimperi (Hochst.) Pichi-Serm. 682
serpentina Baker 662*, 664*, 671*, 672*, 674*, **701**, 706*, 717*, 719*, 723*, Fig. 12, 13
sordescens Jacq. 693
spathulata (L.f.) Klatt 658*, 662*, 663*, 667*, **779**, Fig. 5
spiralis L.f. 768*
stenocarpa Schlecht. 729
stricta Baker 671*, 746*
sulphurea Baker 689, 692*
tenuis Ker 679*, 759, 760*
thomasiae Goldbl. 662*, 674*, 750*, 757*, **758**, Fig. 28, 29
torta L. Bol. 781
tortilis Goldbl. 662*, 663*, 671*, 704*, **705**, 717*, 723*, Fig. 12, 13
tricolor Andrews 662*, 672*, 697*, 709*, 711*, 712*, **714**, 781*, Fig. 17
tricuspidata (L.f.) Lewis 662*, 667*, 750*, 761*, 763*, **765**, 767*, 774*, Fig. 32
tricuspis (Thunb.) Ker 765
—var. *lutea* Ker 767
—var. *ocellata* D. Don 773
tripetala (L.f.) Ker 662*, 667*, 671*, 674*, 675*, 750*, **751**, 755*, 756*, 757*, 758*, 759*, 761*, Fig. 5, 27, 28
—var. *jacquinii* Schlecht. ex Lewis 751, 754*
—var. *mutila* (Licht. ex R. & S.) Baker 751
tristis (L.f.) Ker 677*, 693, 695*
tulbaghensis L. Bol. 662*, 669*, 672*, 675*, **777**, Fig. 34
undulata Ker 689
undulata (L.) Thunb. 689, 691*
unguicularis Lam. 759*
unguiculata Ker 662*, 664*, 667*, 674*, 679*, 750*, 757*, 758*, **759**, 775*, Fig. 5, 30
vegeta L. 662*, 672*, 675*, 676*, 677*, 681, 686, 687, **693**, 697*, 700*, 707*, Fig. 8
villosa (Ker) Ker 662*, 668*, 671*, 672*, 674*, 675*, 679*, 745*, 750*, 765*, 766*, 772*, 774*, **775**, 777*, 778*, 779*, Fig. 5, 34
violacea Baker 759
violacea L. Bol. 759
viscaria (L.f.) Ker 662*, 667*, 732*, 733*, **735**, 738*, 739*, Fig. 24
viscaria sensu Ker 737
—var. *bituminosa* (L.f.) Baker 732
zeyheri Lehm. 781
Morea 676*, 681
Phaianthes 681
lurida (Ker) Raf. 681, 762
Proteaceae 667*
Pinus pinaster Ait. 669*
Restionaceae 667*
Rutaceae 667*
Sisyrinchium 679*
Tigridia 764*
Tritonia crocata (L.) Ker 677*
Tritoniopsis unguicularis (Lam.) Lewis 759*
Vieusseuxia de la Roche 676*, 677*, 679*, 680*, 681, 745, 768*, 771*, 773*
angustifolia Eckl. 689
Aristata de la Roche 676*, 773
aristata sensu Houtt. 775
aurantiaca Eckl. & Zey. 764*
bellendenii Sweet 767

bituminosa (L.f.) Eckl. 732
brehmii Eckl. 689
edulis (L.f.) Link. 725
freuchenia (Eckl.) Steud. 687
fugax de la Roche 725, 773
geniculata Eckl. 706
glaucopis DC. 773, 774*
graminifolia Eckl. 693
intermedia Eckl. 699
lurida (Ker) Sweet 762
mutila C.H. Berg ex Eckl. 751
nervosa Eckl. 699
pavonia (L.f.) DC. 769, 774*
pulchra Eckl. 751
rivularis Eckl. 693
spiralis de la Roche 676*, 681, 745, 749, 767, 768*
tenuis (Ker) R. & S. 759
tricuspis (Thunb.) Ker 765
tripetala (L.f.) Klatt 751
tripetaloides DC. 751
villosa (Ker) Spreng. 775
viscaria (L.f.) Eckl. 735